Systems programming

2 – System

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Bibliography

- A Unified Formalism for Complex Systems Architecture
  - Section 1.3
    - http://www.lix.polytechnique.fr/~golden/systems_architecture.html
    - http://www.lix.polytechnique.fr/~golden/research/phd.pdf
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System

System

- Set of interacting or interdependent components
  - Forming an integrated whole
  - Delineated by its spatial and temporal boundaries
  - Surrounded and influenced by its environment
  - Described by its structure and purpose
  - Expressed in its functioning

From Wikipedia

Ecosystem

- Ecosystem is an ecological systems.
  - includes all the living things in a given area,
  - interacting with each other, and with their non-living environments
- Each organism has its own niche or role to play.
- Community of organisms and their physical environment
  - interacting together.
- The living and physical components
  - linked together through nutrient cycles and energy flows.

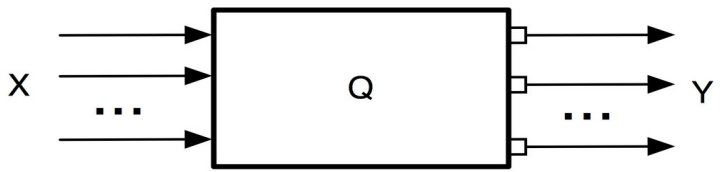
Social system

- Interdependent set of cultural and structural elements
  - that can be thought of as a unit.
- Embodies one of the most important sociological principles:
  - that the whole is more than the sum of its parts.
- A social system refers to a complex network of interrelated social entities,
  - that interact and influence one another within a shared environment or society.
- Interactions are guided by norms, values, roles and patterns of behavior
- Exhibit patterns of organization, stability, and adaptation
  - serving various functions and purposes within society.

System principles

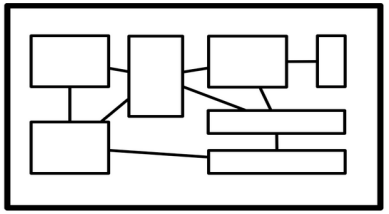
Fundamental principles

- The objects of the reality are modeled as systems
  - objects perform function defined by its perimeter, inputs, outputs and an internal state



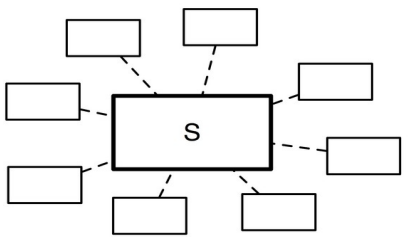
Fundamental principles

- Systems can be broken down into a set of smaller subsystems,
  - Which are less than the whole system
  - Composition emerges new behaviors



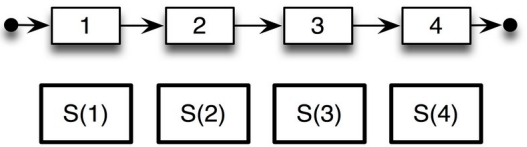
Fundamental principles

- Systems must be considered interacting with other systems
  - Its environment
  - Other systems



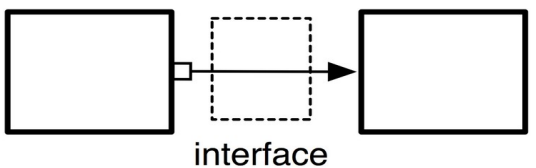
Fundamental principles

- Systems must be considered through its whole life-cycle
  - From the moment it starts being designed, produced, operated, disposed



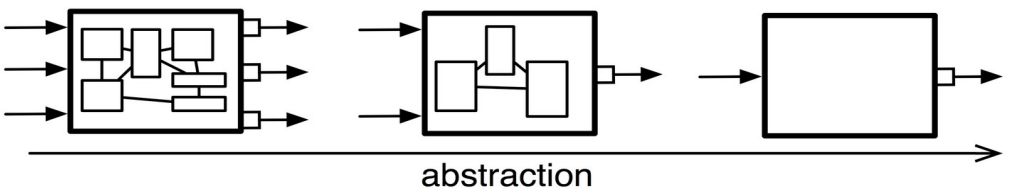
Fundamental principles

- Systems can be linked to another through an interface,
  - Which models the properties of the link



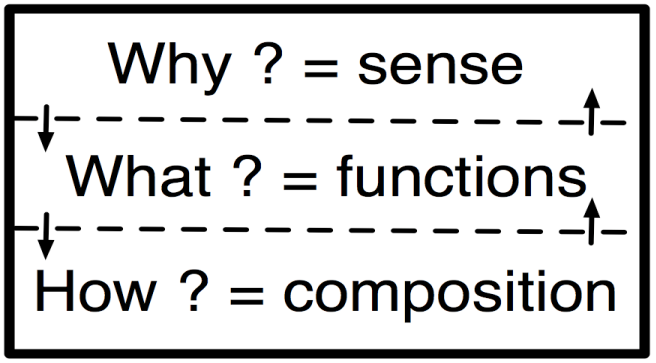
Fundamental principles

- Systems can be considered at various abstraction levels,
  - Allowing only relevant properties/behaviors to be considered



Fundamental principles

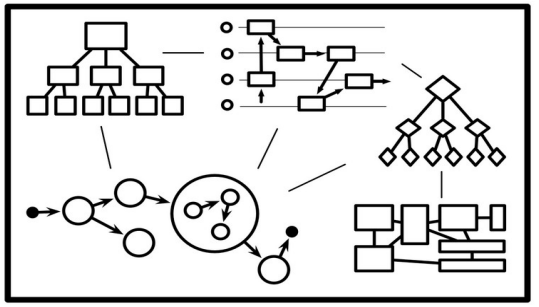
- Systems can be viewed according to various layers



- Sense
  - Why is it being produced / offered functionality
- Functions
  - Operations to fulfill offered functionality
- Composition
  - Definition of components necessary to implement the functions

Fundamental principles

- Systems can be described through interrelated models with given semantics
  - Properties that the system should provide / requirements
  - Structure of the various components
    - and how they interact
  - States of the system
  - Behaviors of the system
  - Manipulated data, etc



Described with SysML

Fundamental principles

- Systems can be described through different viewpoints
  - corresponding to various actors concerned by the system.
- All visions are important
  - define the system in complementary ways.
- Different stakeholders
  - commercials, designers, software engineers, electronic enginners, usability, users, repairers ...