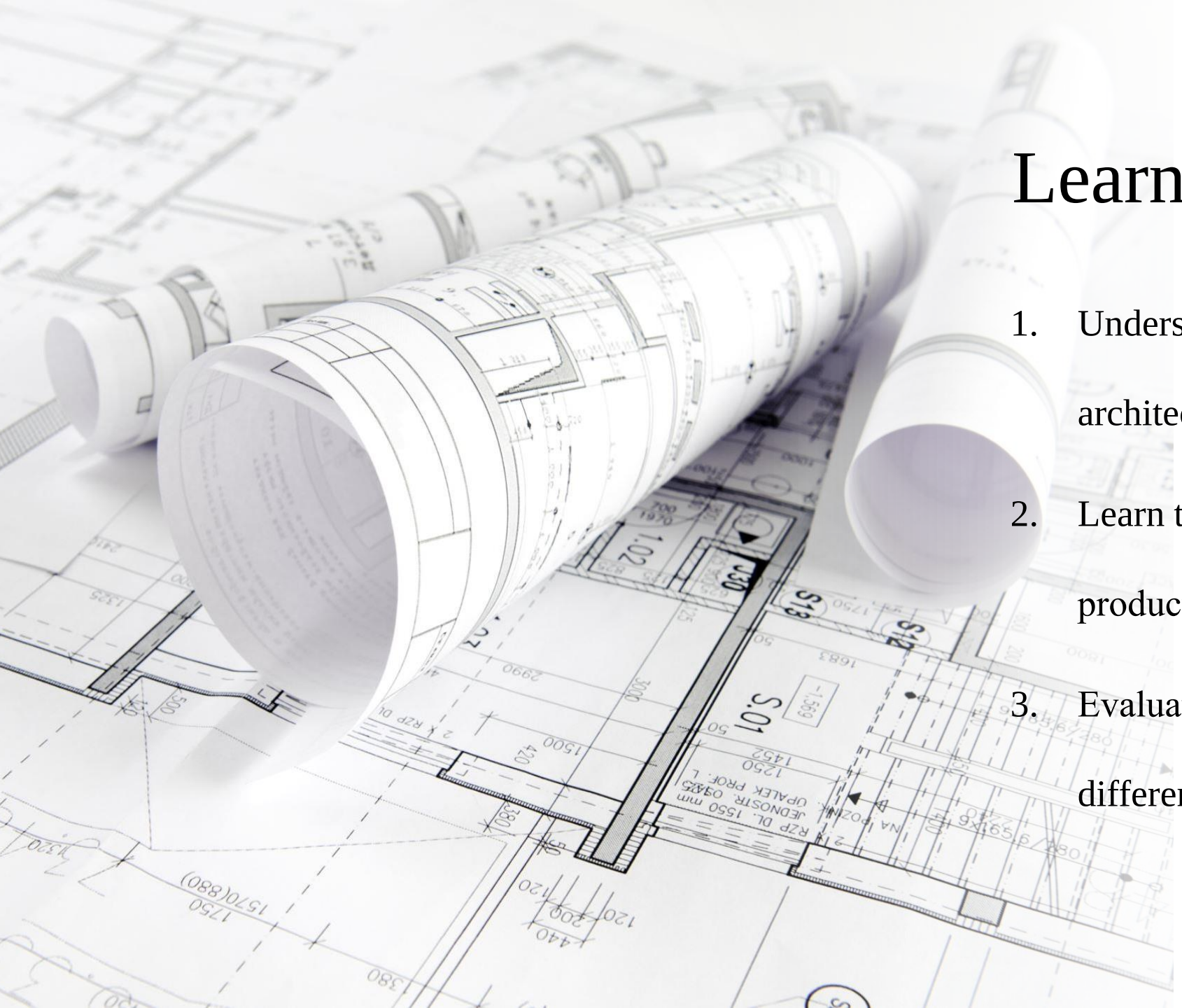
Product Architecture



Learning Objectives

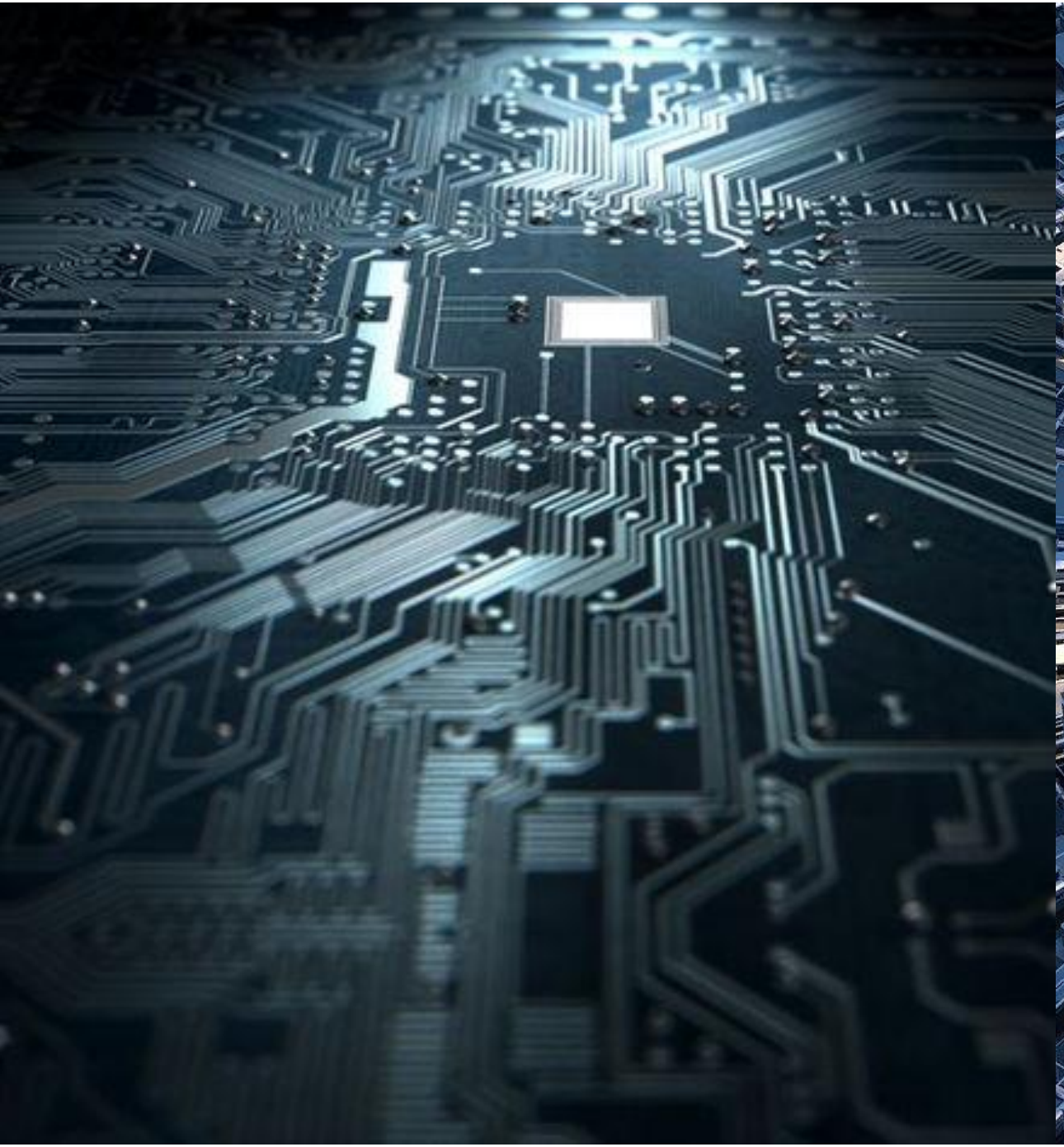
1. Understand fundamentals of the product architecture development
2. Learn to apply fundamentals to develop a new product’s architecture
3. Evaluate the product’s architectural differences, features and limitations

What’s Product Architecture?

Product architecture mainly deals with how a product is arranged into physical parts, components and assemblies.

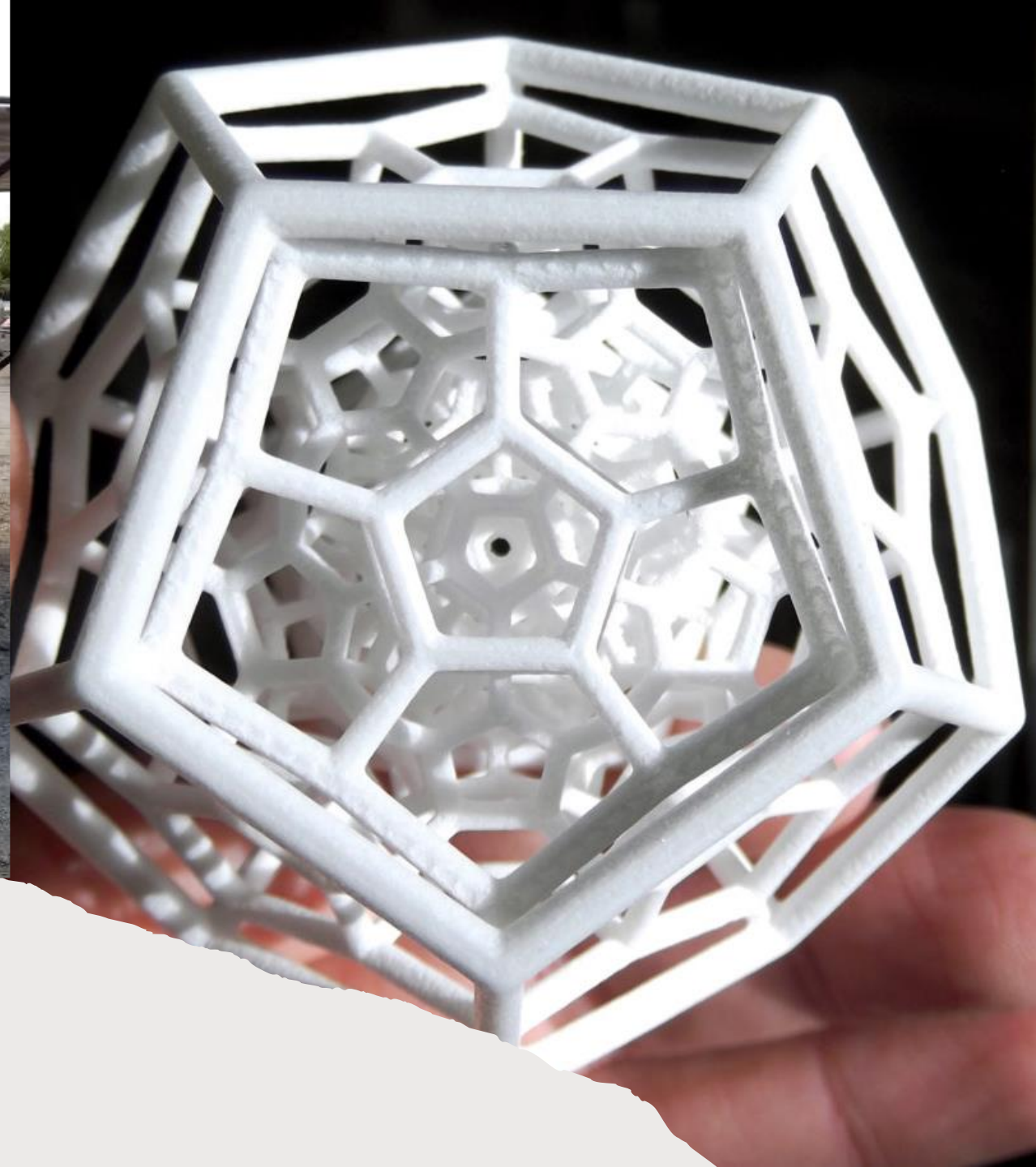
It can be defined more precisely as:

1. The arrangement of functional elements.
2. The mapping from functional elements to physical components.
3. The specification of the interfaces between interacting physical components.



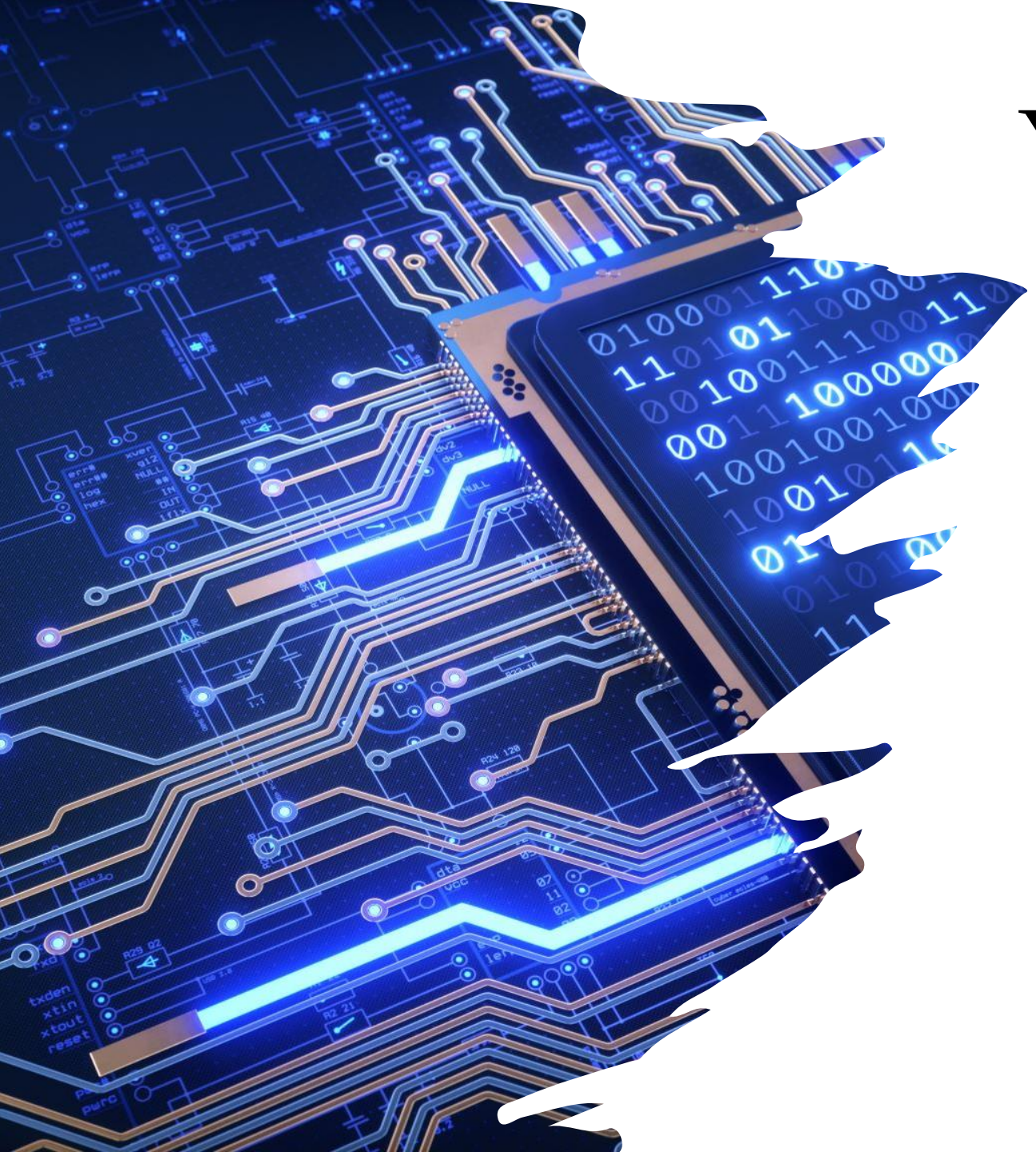
Modular Product Architecture

One Function→ One Component



Integrated Product Architecture

One Function → Multiple Components
Multiple Functions → One Component



Your Opinion..?

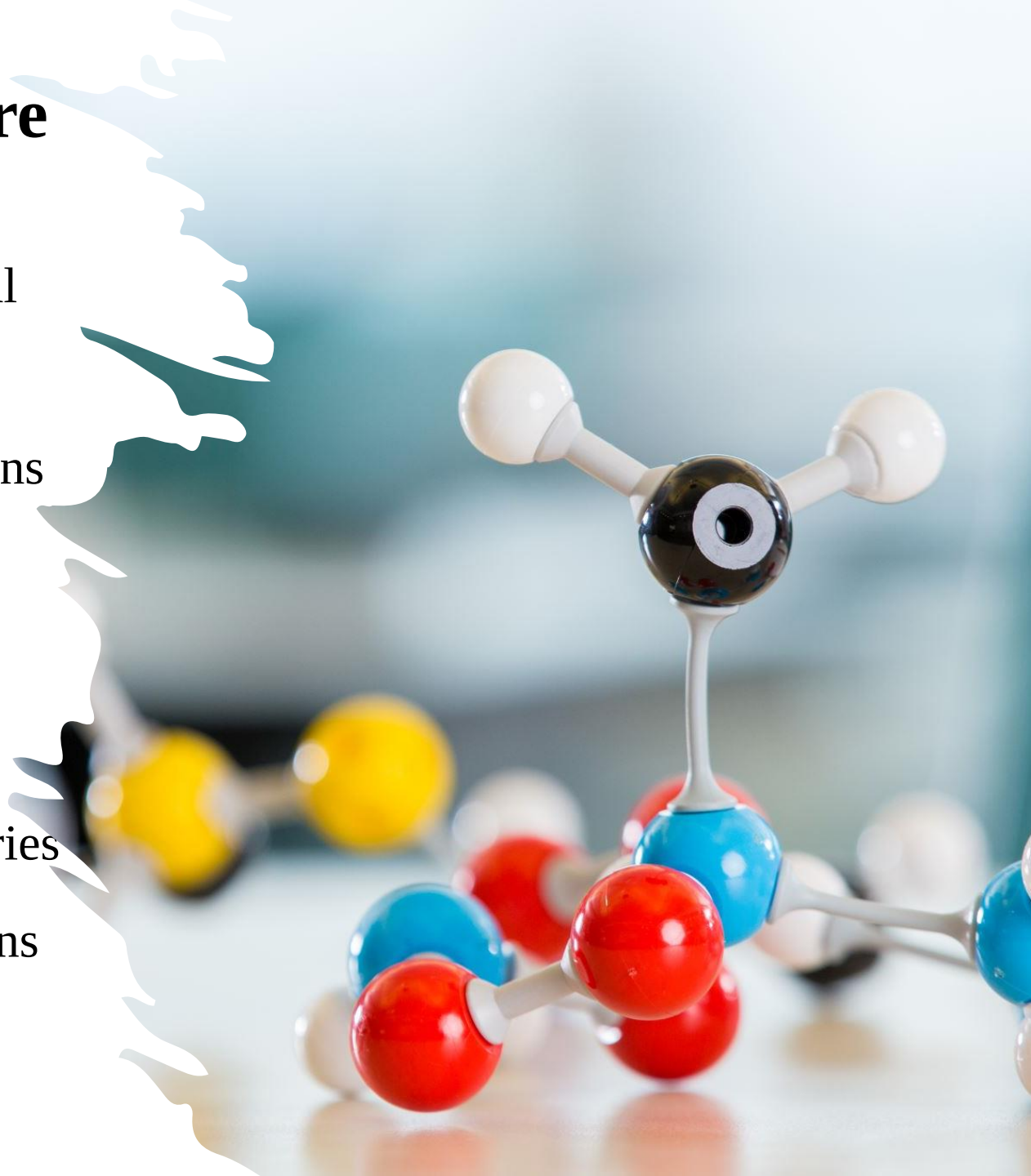
Is one type of product architecture (modular vs. integral) better than the other?

- Performance
- Serviceability
- Sustainability
- Cost to develop
- Cost to manufacture
- Maintenance

Mixed Product Architecture

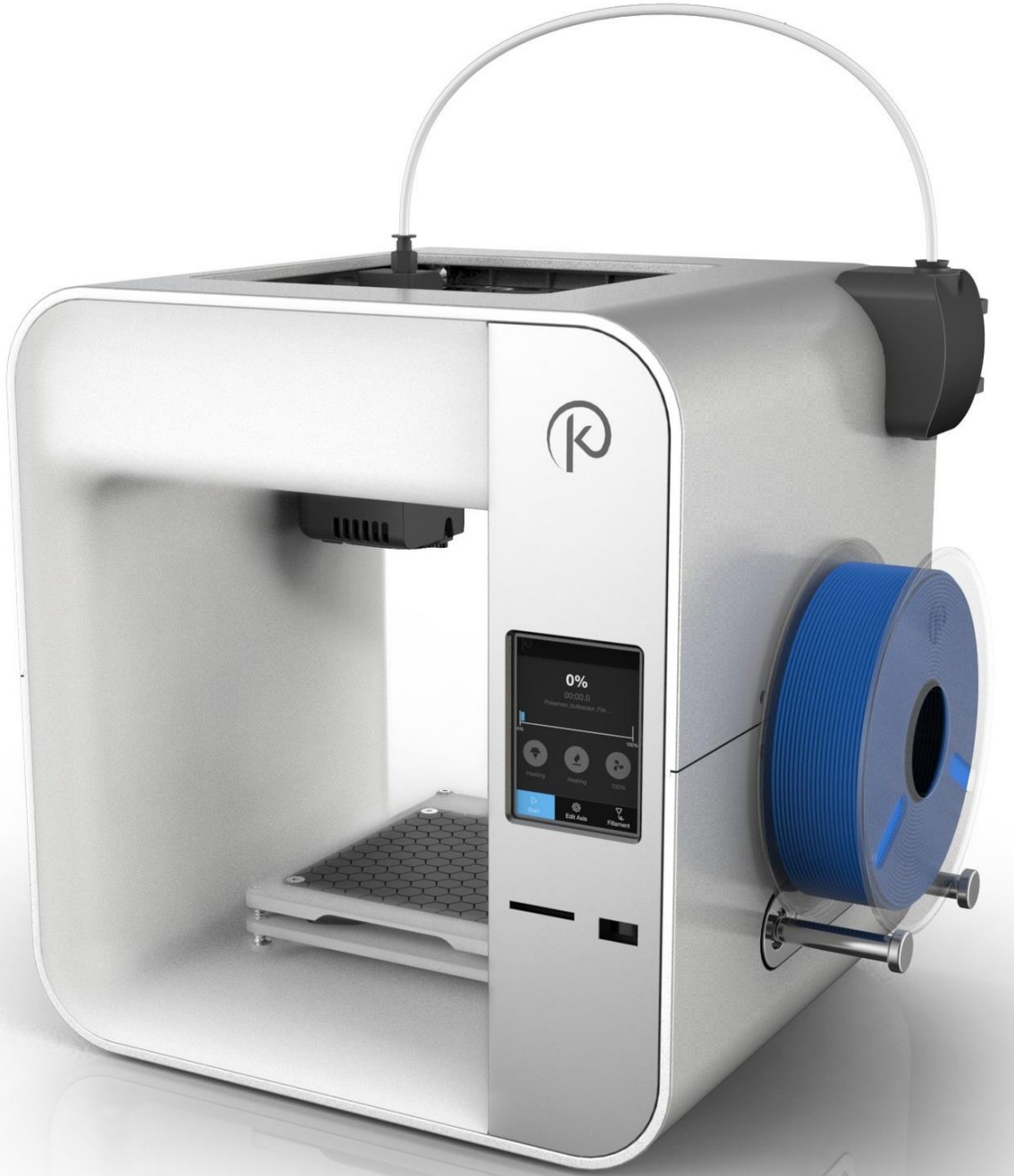
Steps to Define Product Architecture

1. Identify and list all possible functions essential to build a product
2. Understand the relation between those functions
3. Create a functional model/ diagram showing those relations
4. Create Clusters
5. Draw approximate product layouts or geometries
6. Identify mandatory or unintentional interactions between those functions



Practical Example

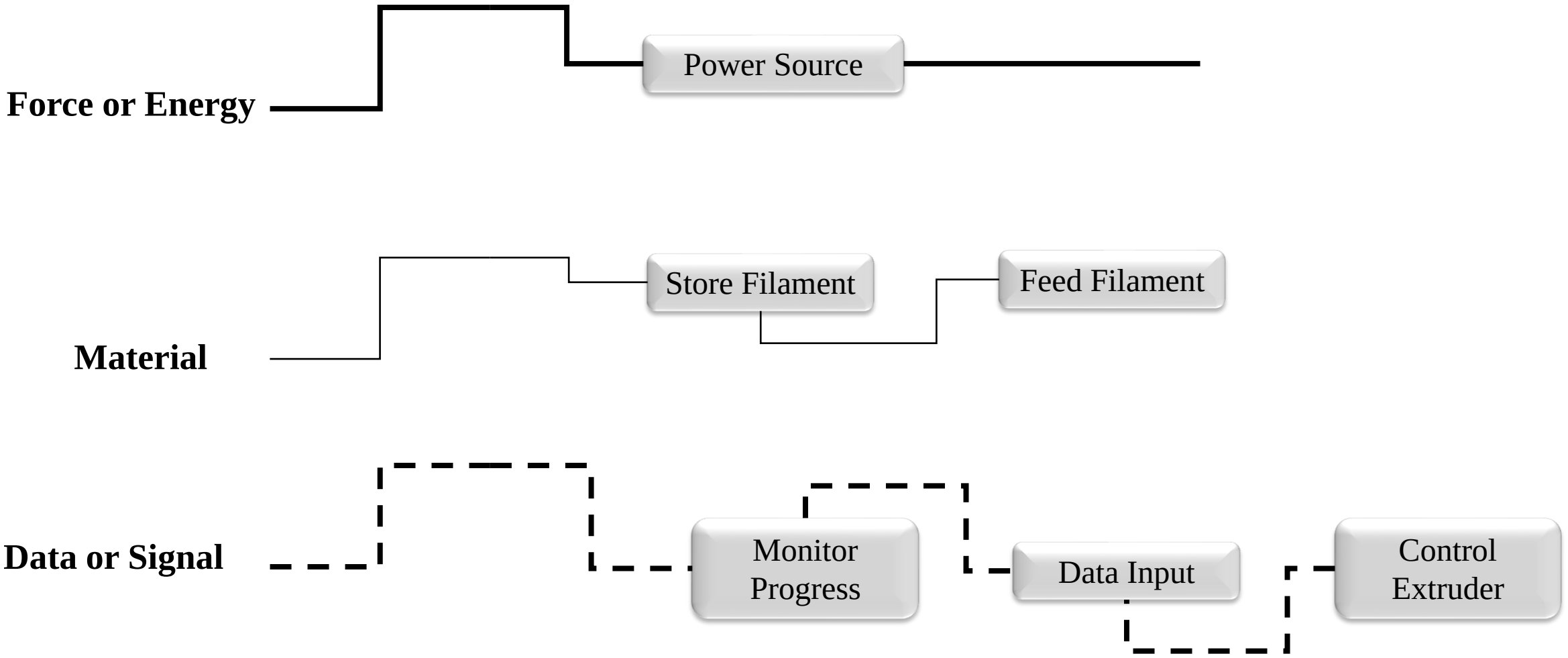
3D Printers



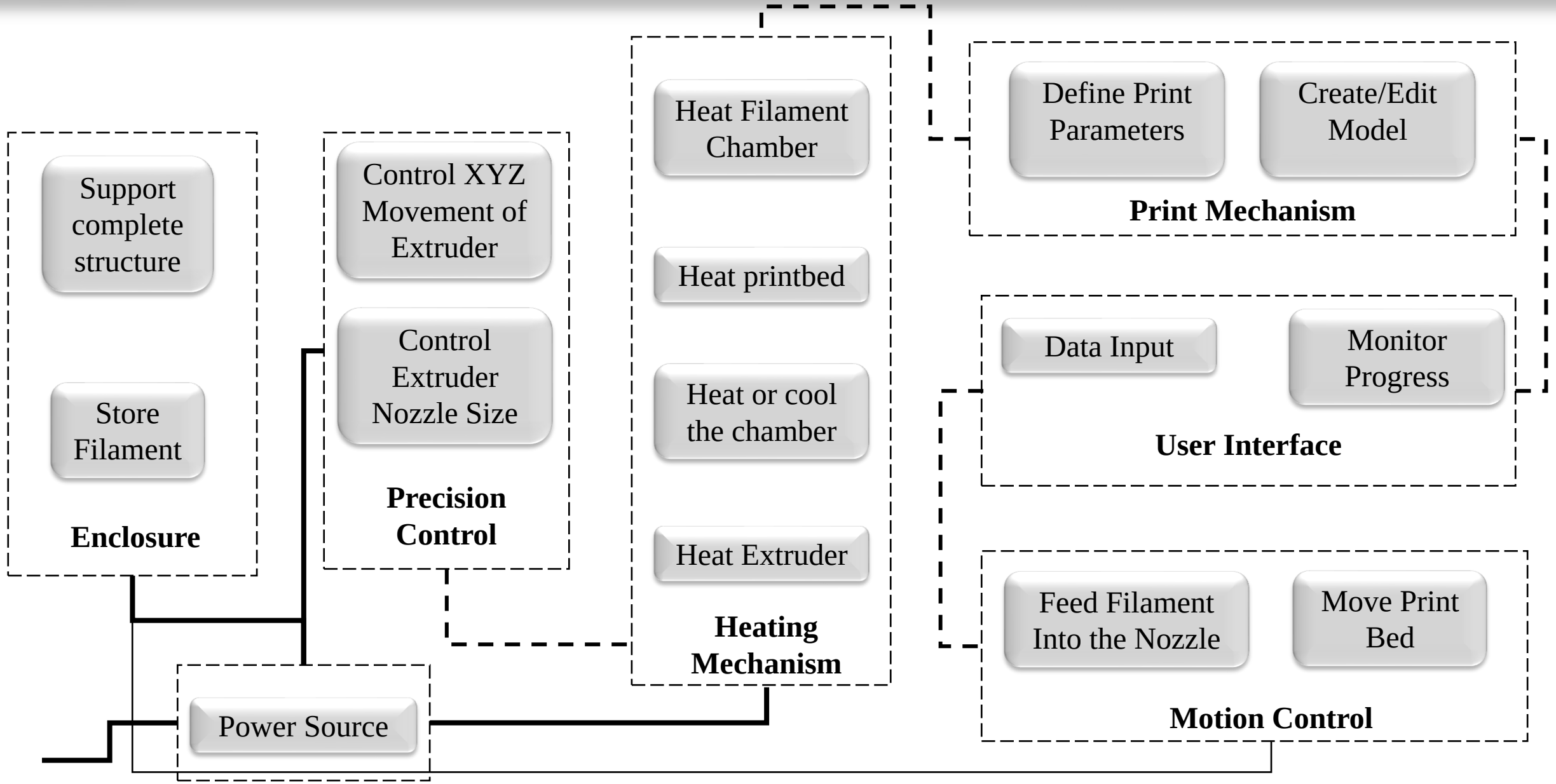
Functions Essential to Build a 3D Printer

- Define Print Parameters
- Heat or Cool the Chamber
- Store Filament
- Heat Print Bed
- Heat Extruder
- Support the Structure
- Monitor Progress
- Control Extruder
- Data Input
- Create Model
- Control XYZ Movement
- Feed Filament

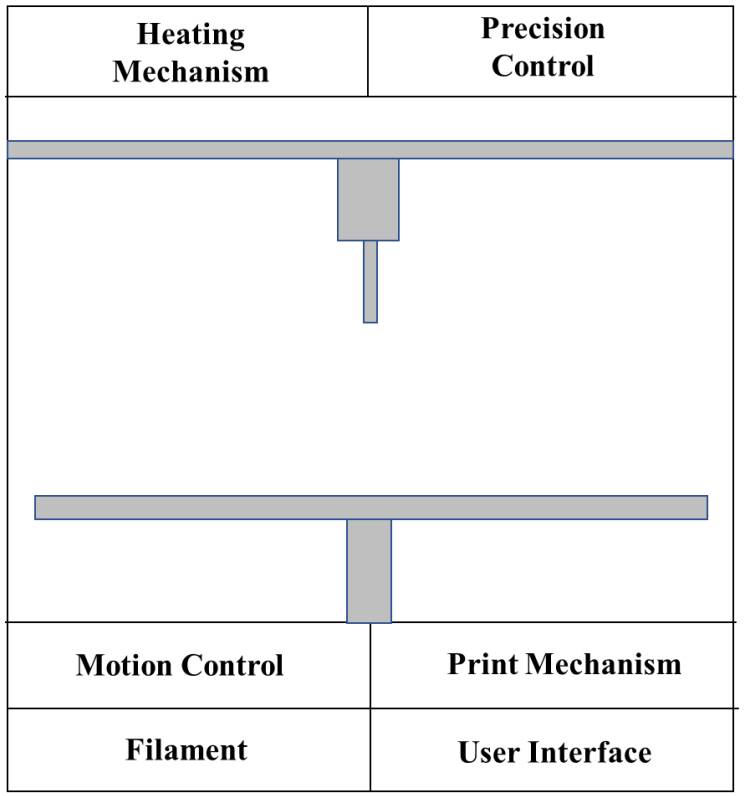
Relation Between Functions



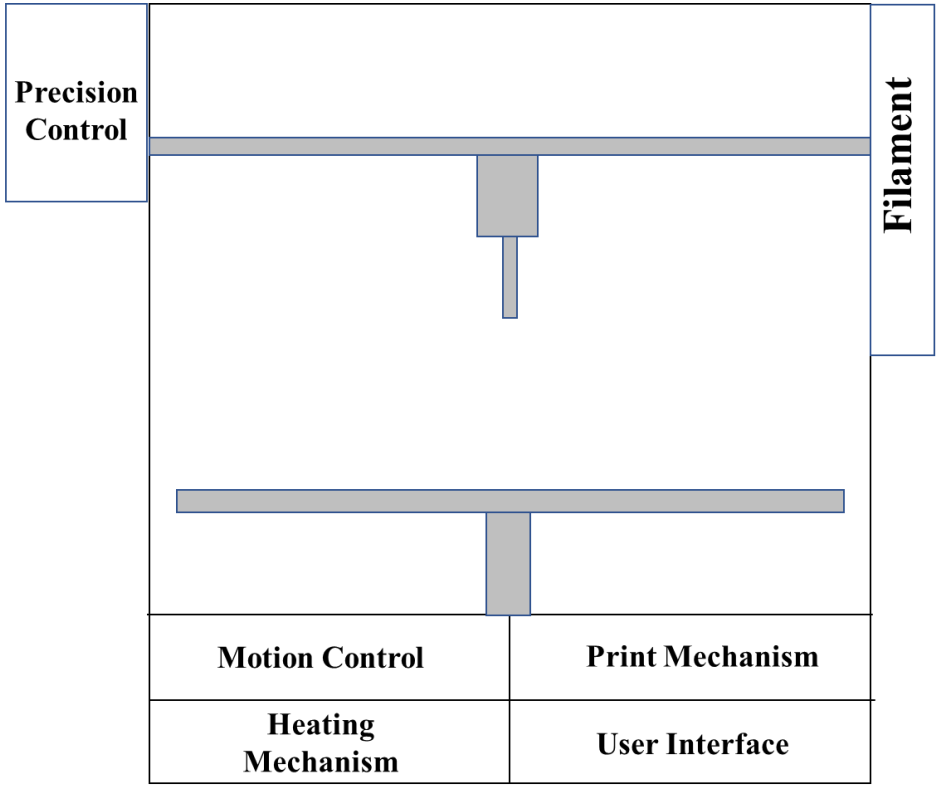
Chunks


Support complete structure
Store Filament
Enclosure
Control XYZ Movement of Extruder
Control Extruder Nozzle Size
Precision Control
Heat Filament Chamber
Heat printbed
Heat or cool the chamber
Heat Extruder
Heating Mechanism
Define Print Parameters
Create/Edit Model
Print Mechanism
Data Input
Monitor Progress
User Interface
Feed Filament Into the Nozzle
Move Print Bed
Motion Control
Power Source

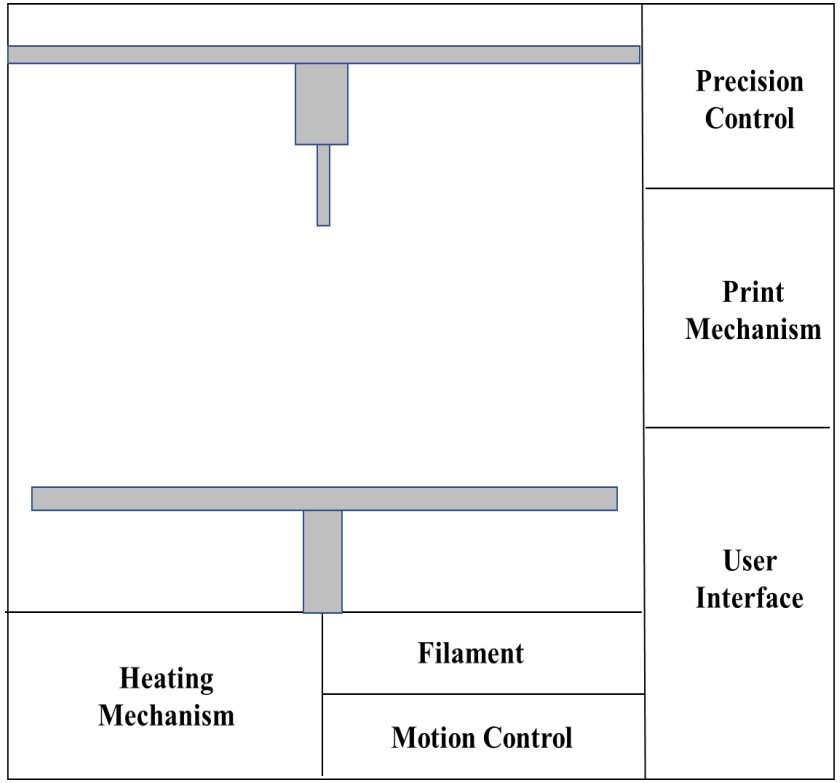
Geometric Layout 1



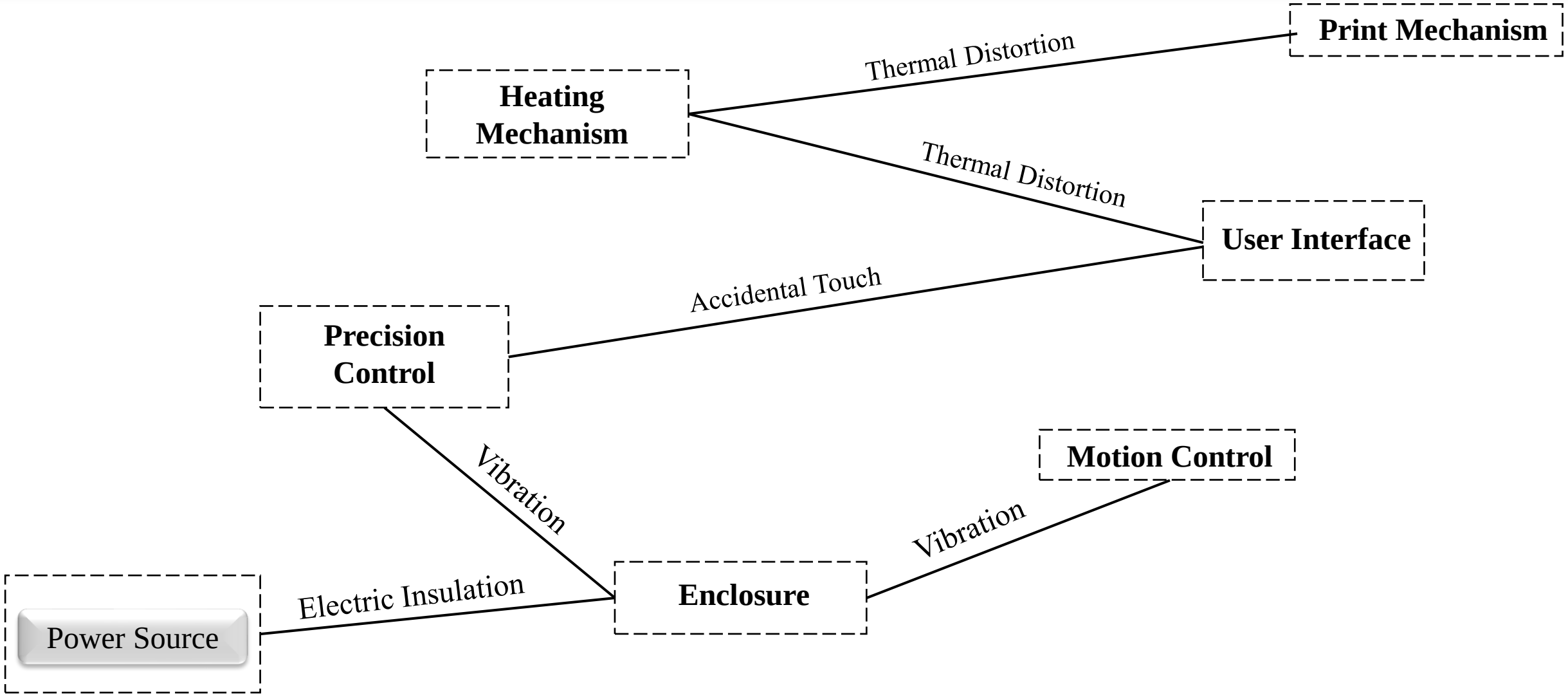
Geometric Layout 2



Geometric Layout 3



Interaction Graph



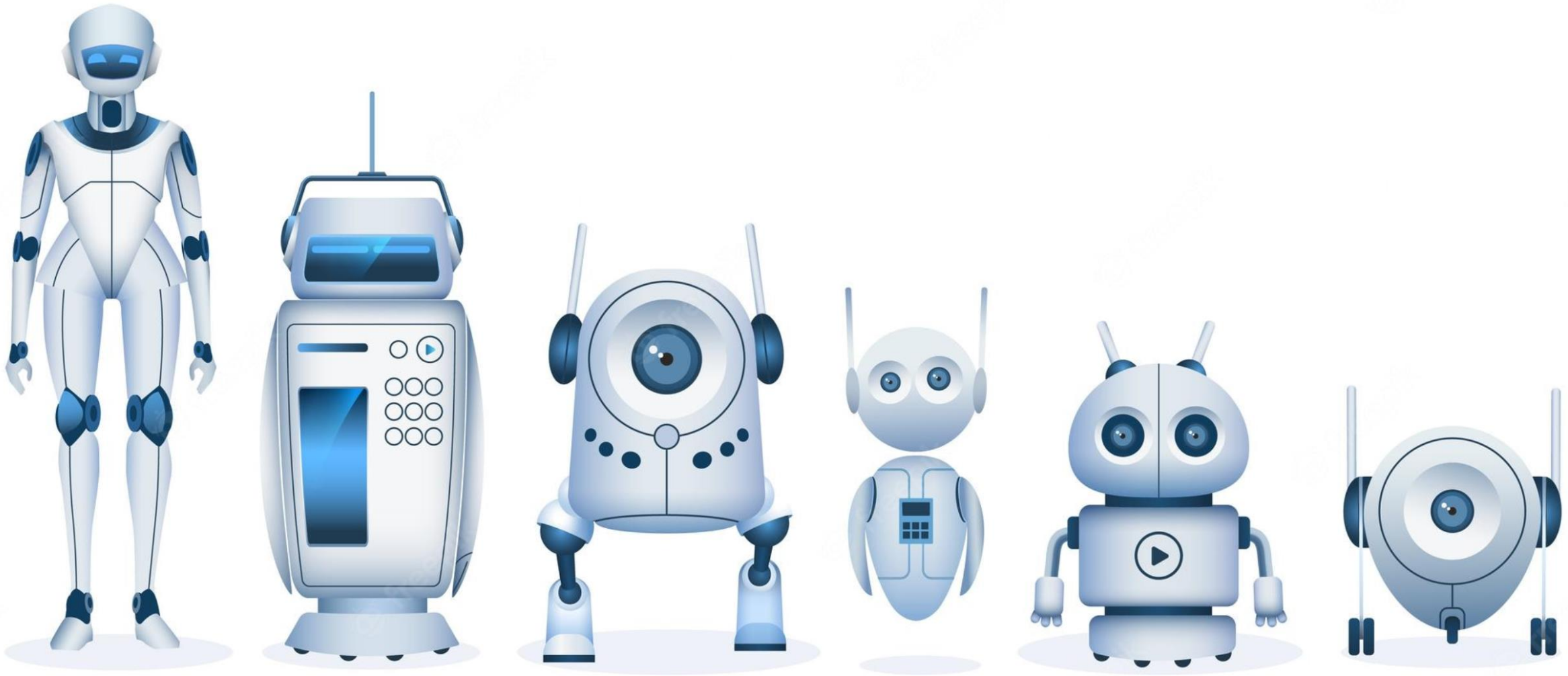
Pro Tips

Generally, we can group technical decisions into three categories

- ***Technical decisions that are easy to change:*** Type of material used, minor versions of software libraries, etc.
- ***Low-risk technical decisions which we probably don't need to change:*** Using Linux as OS or Android Based system etc.
- ***High-risk technical decisions:*** Buying storage for a local data center, deciding on a software language, a wireless protocol or a framework/platform, etc

Summary

- Architecture choices define the sub-systems and modules of the product platform or family.
- Architecture determines:
  - Ease of production variety
  - Feasibility of customer modification
  - System-level production costs
- Key Concepts:
  - Modular vs. Integral architecture
  - Clustering into chunks
  - Planning product families



Thank You!