Massachusetts
Institute of
Technology

Architecture of Complex Systems

Key Takeaways

WEEK 3: SYSTEM ARCHITECTURE

This week, you reviewed a framework that helps build a better architecture.

Needs → Solution-Neutral Function → Concept → Architecture

The framework starts by defining the solution-neutral function based on the underlying need. Then comes the concept, which is generated based on the solution-neutral function. Finally, the architecture is created based on the concept.

Defining the needs in a solution-neutral way is a critical first step towards being a good architect. It enables the architect to consider various different concepts that help satisfy the underlying need and choose the best possible one.

You learned that the solution-neutral function follows a hierarchy. It starts at a low level that is very solution specific and moves to a higher level that is more solution neutral, but with a broader scope. In the end, it is up to the architect to help decide what level of solution neutral best fits the needs. A very high level might be too abstract for any concrete decision making, whereas a low level might be too specific and could restrict the design of an optimum solution.

You also learned about concept, which is the mapping of form to function that helps satisfy the underlying goal. We need both form and function to define the concept. One creative way of generating concepts (shown in the videos) is to list out form and function and then mix and match the different combinations to generate different concepts.

Concept is a guiding tool that helps us create an architecture. An architecture has much more detail than a concept and is an extension of the concept with a lot more information added that is required for development of the system. It is generally more complex than a concept, and it contains information such a decomposition of form and function, mapping of form and function, and much more.

In designing the architecture, an important task of the architect is to decide what decisions are architecture decisions and incorporate them into the architecture upfront, since they might drastically impact the end results

A good guiding principle for architecture decisions is to ask:

- **Is it sensitive?** Does the decision influence metrics of interest?

- **Is it coupled?** How connected are the decisions? What impact will it have on other decisions or parts of the system?

Any decision that satisfies both is an architecture decision.