CS3213 Project – Week 3

Requirement Modeling | 26-01-2022

- ❑ Discussion Requirement Elicitation
- ❑ Discussion Requirement Models
- ❑ Comments to Software Architecture

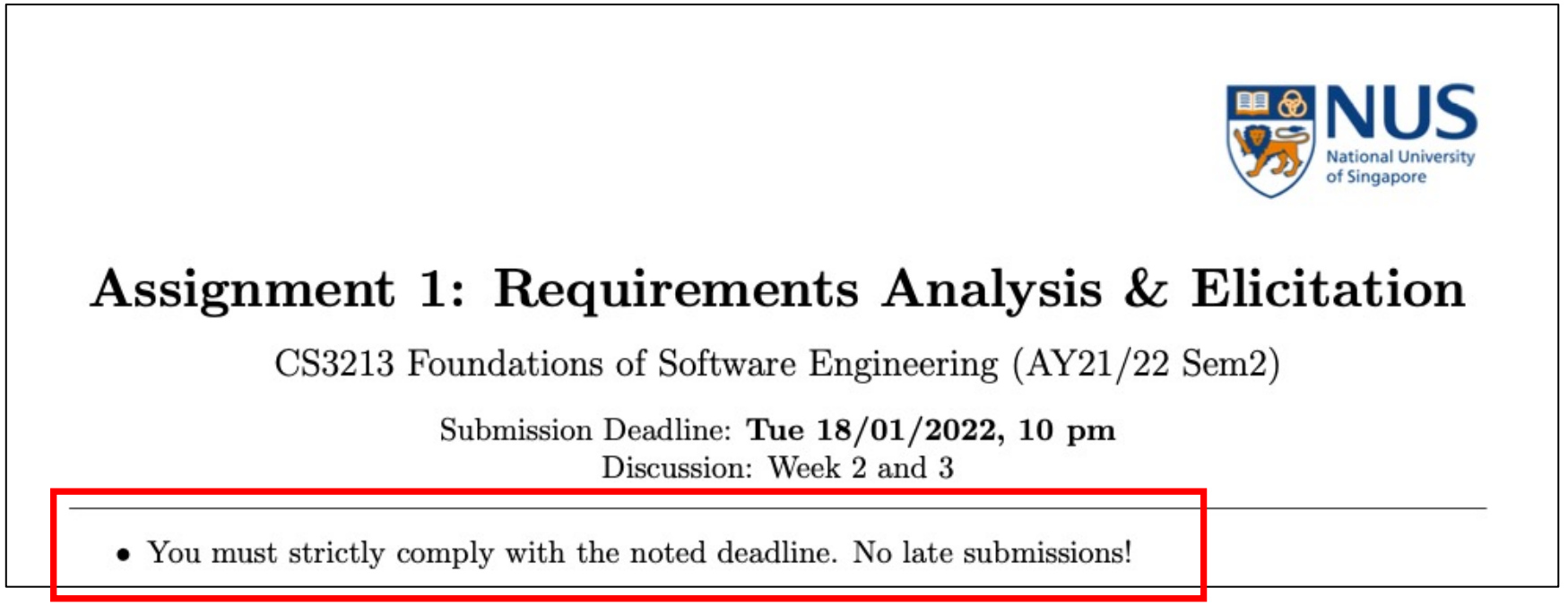
Group & Project Selection Deadlines

~~**Deadline** for group registration[1]:~~
~~**Friday, Jan 21, 10 am**~~

Deadline for project selection[1]:
Friday, Jan 28, 10 am

[1] https://docs.google.com/spreadsheets/d/15sk6WnvQHTjClhMi_TUuyDkylow6lOmMHVhD5n3Qu-I/edit?usp=sharing

Comment for „late“ submissions



NUS National University of Singapore

Assignment 1: Requirements Analysis & Elicitation

CS3213 Foundations of Software Engineering (AY21/22 Sem2)

Submission Deadline: **Tue 18/01/2022, 10 pm**
Discussion: Week 2 and 3

- You must strictly comply with the noted deadline. No late submissions!

→ See CS3213 assignments as a project and manage your deadlines accordingly.

Sidenote: also check the naming scheme!

Last two weeks

- ❏ A1: Requirements Analysis & Elicitation
- ❏ Requirements Elicitation with Stakeholders
- ❏ A2: Requirements Modeling

Requirements Analysis & Elicitation

will be discussed in the lab sessions

some remarks today

Requirement Elicitation – Closing Remarks

- ❏ begin **gentle** and proceed with **caution**
- ❏ prepare your **catalogue of questions** and ask **systematically**
- ❏ reveal **contradictions**
- ❏ **special cases** usually require more effort as the default case – you need to explore **all eventualities** in the system **with** the customer
- ❏ do not forget the **„as-is“ state**
- ❏ Jewish motherhood (example of the *door access system*)

Discussion: Requirement Models

- *submitted models will be discussed in the lab sessions*
- different models have different **purposes**
  - Goal Model: Stakeholders become more aware of potential alternatives for meeting their goals, and are therefore less likely to over-specify by prematurely committing to certain technological solutions.
  - Use Case Model: overview functional features of system, easy understandale description of scenarios and special cases
  - Activity Diagram: process flows and their actions/activities
  - Sequence Diagram: interaction between objects
  - State Transition Chart: object states and their transitions
  - …

Common Modeling Purposes

- clarifying requirements
  - modeling techniques need to support "why" and "how else" types of reasoning analysis
  - incremental process
- provide traceability of rationales
- management of change
- verification of achievement of requirements
- support of reuse

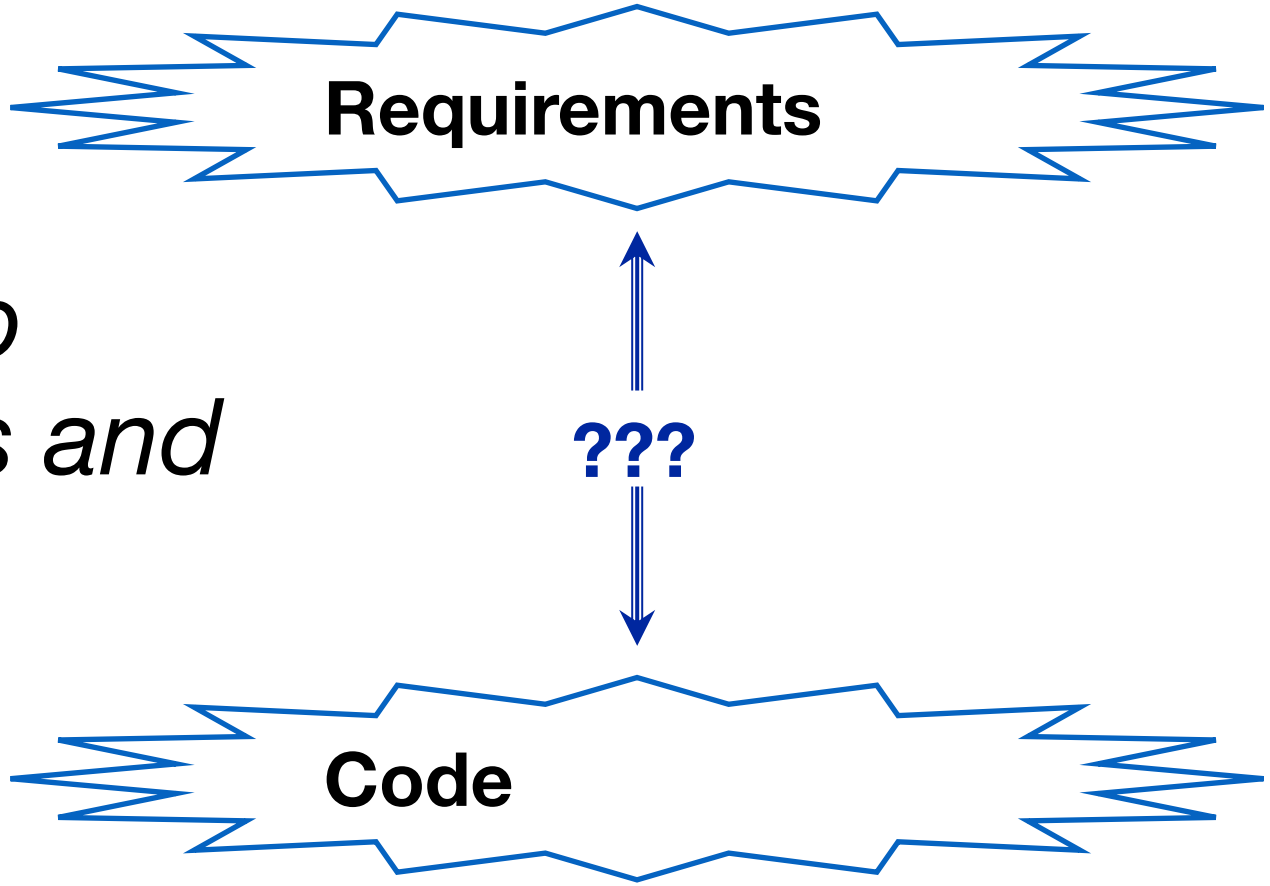
Requirement Engineering – Common Challenges

- ❏ Limited access to project stakeholders
- ❏ Project stakeholders do not know what they want
- ❏ Project stakeholders change their minds
- ❏ Conflicting priorities
- ❏ Developers don’t understand the problem domain
- ❏ Developers don't understand the requirements

Any remaining question about requirements engineering?

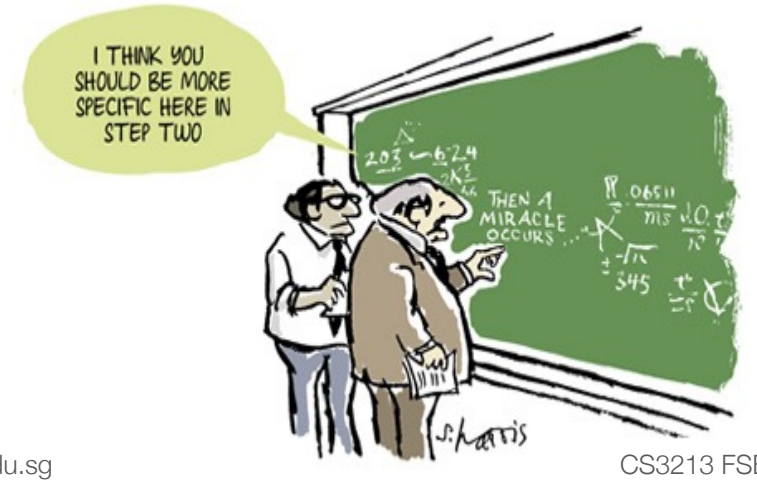
Comments to Software Architecture

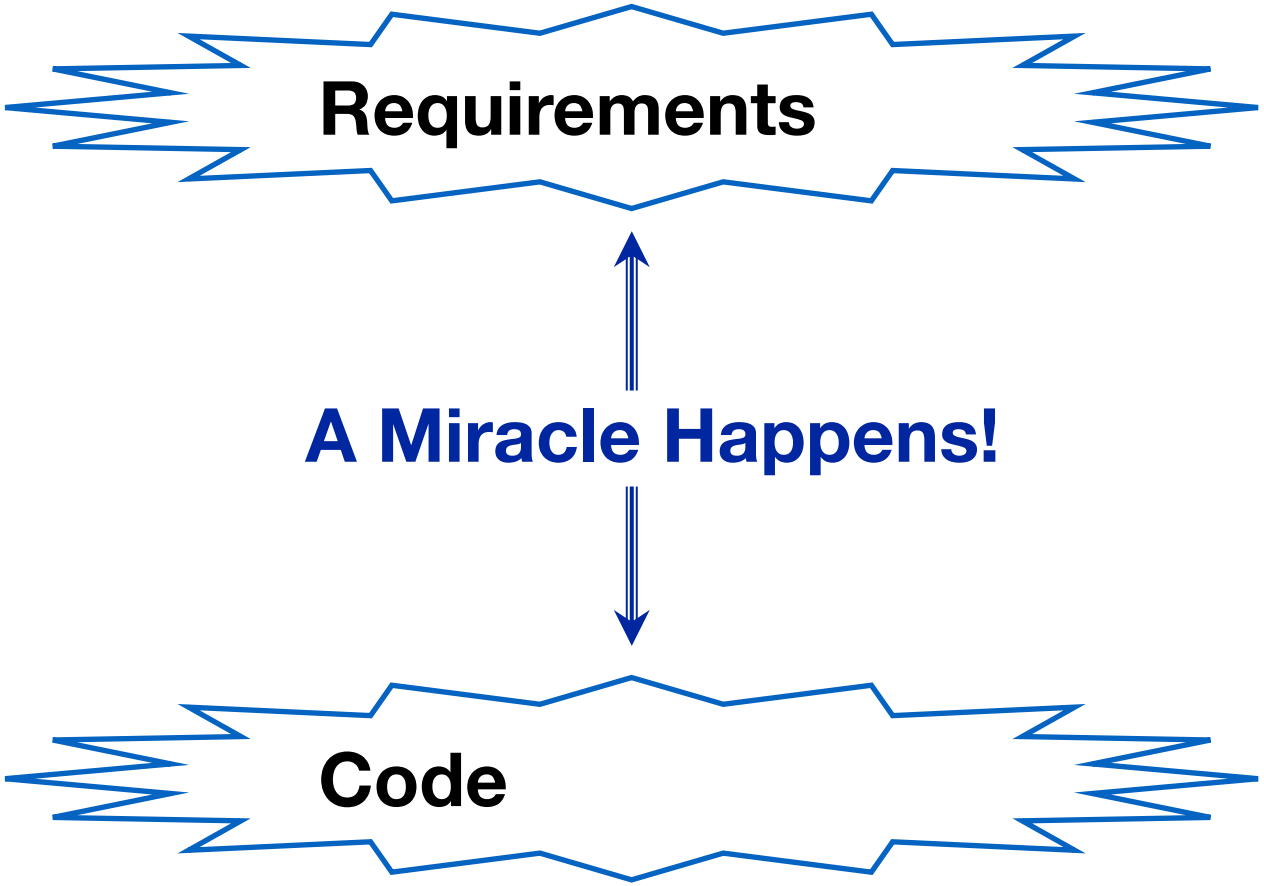
How to bridge the gap between requirements and code?



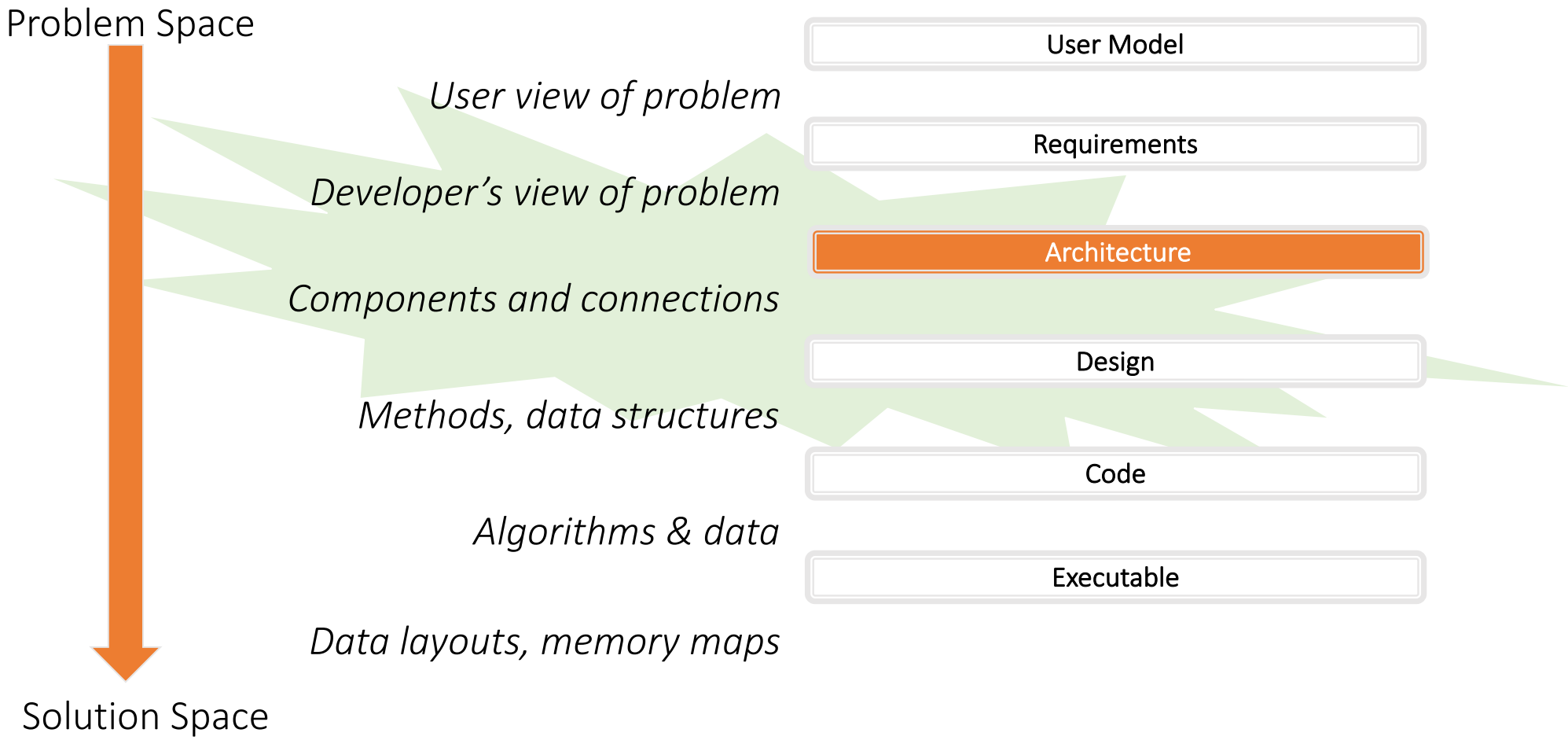
The Traditional Answer

- ❑ Ad hoc
- ❑ Requires gurus
- ❑ Unpredictable
- ❑ Costly

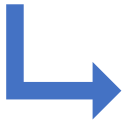




Role of Software Architecture: Bridging the Gap



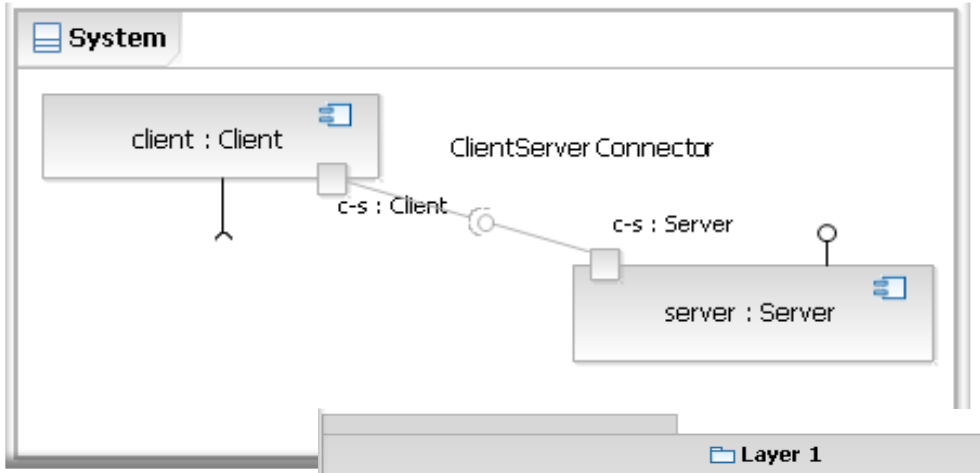
Architecture as Tool for Managing Complexity

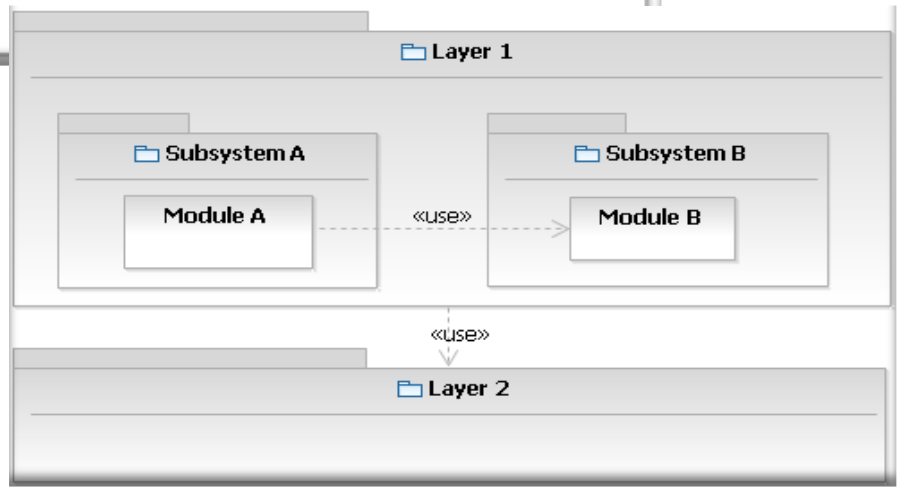


is a result of software engineering challenges and software's nature (overlay of all challenges, imprecise specifications, …)

Let's view *Software Architecture* as *conceptual tool* for dealing with the **complexity**. That is, architecture is a set of concepts which impose **order on complexity**.

Stuctures!





- ❑ What elements are there?
- ❑ How are they interconnected?
- ❑ What does the connection mean?

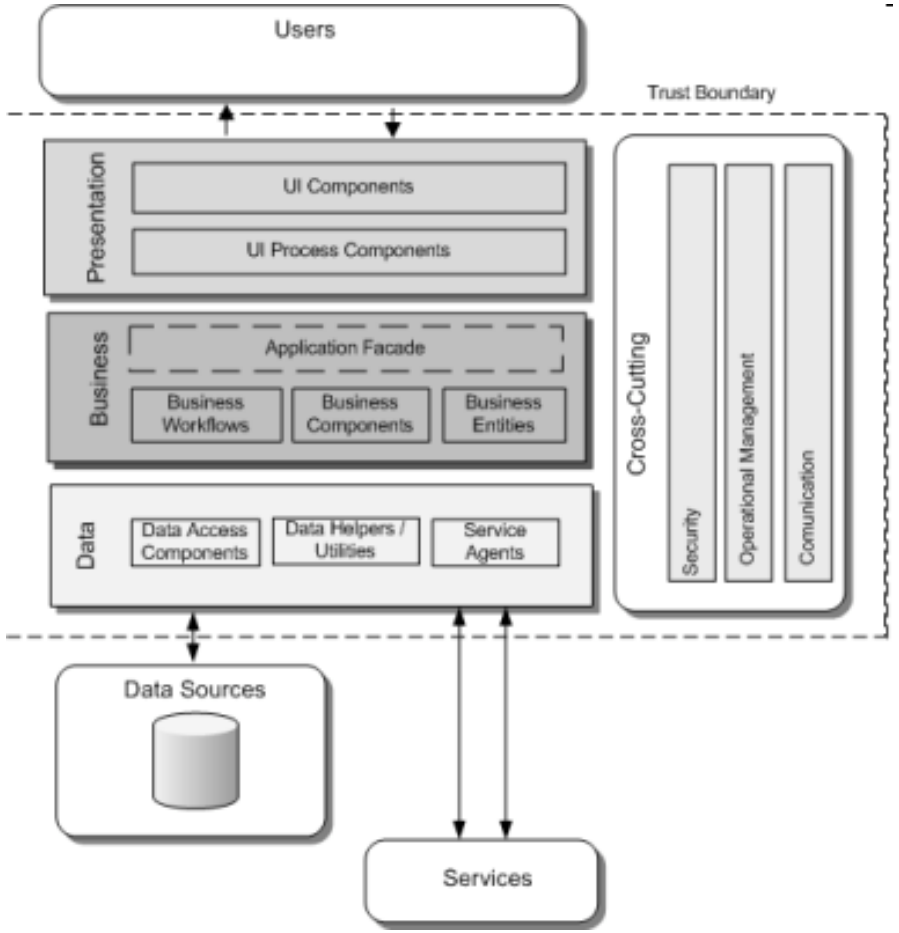
Overall conceptual idea:

→ Each part can be built fairly independently of the other parts

→ However, these parts must be put together to solve the larger problem in the end

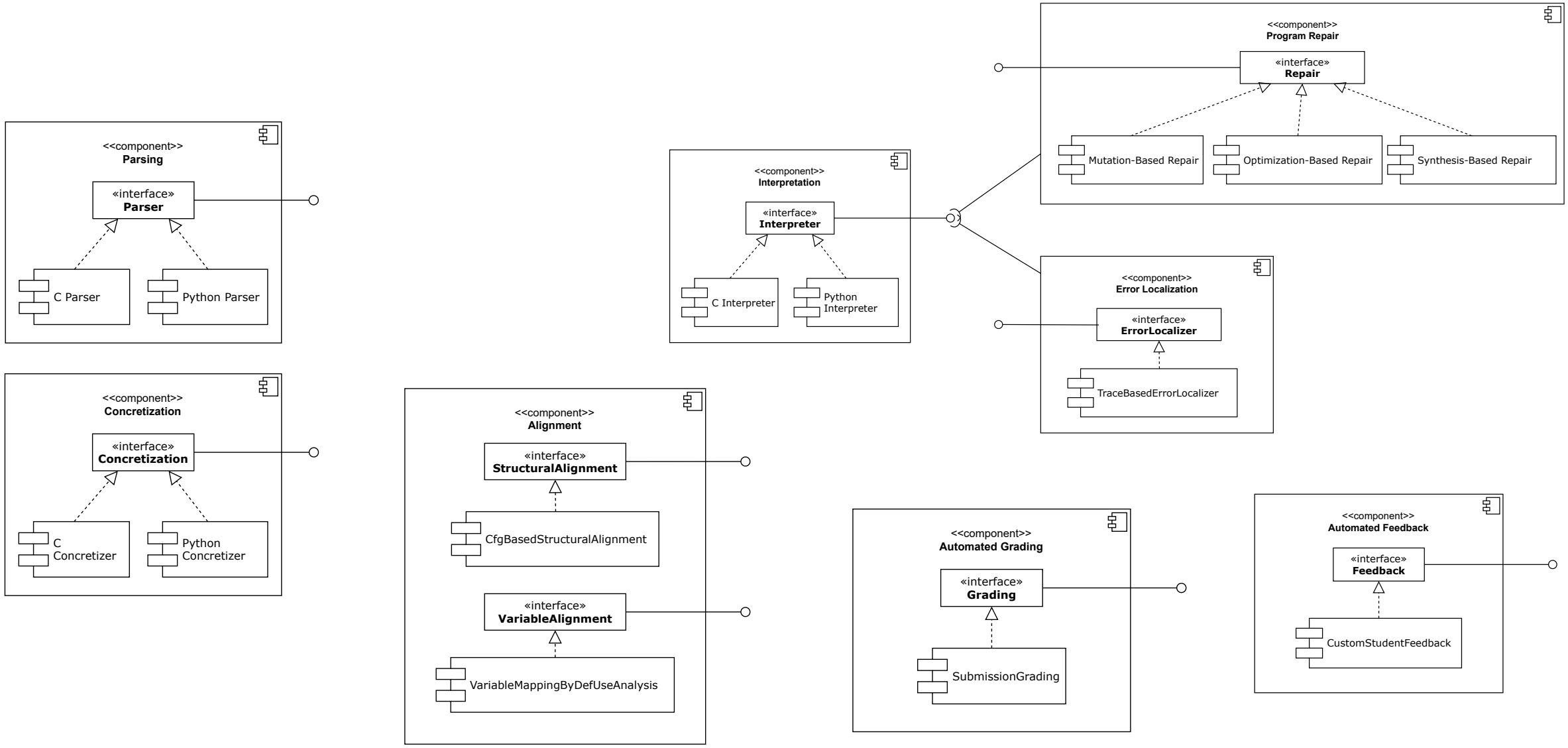
Static Structures: Focus on Components

- E.g. layered architecture
- Typical example often found in practice
- Meaning of boxes and lines is not defined
- Incomplete representation of relationships existing in the presented structure



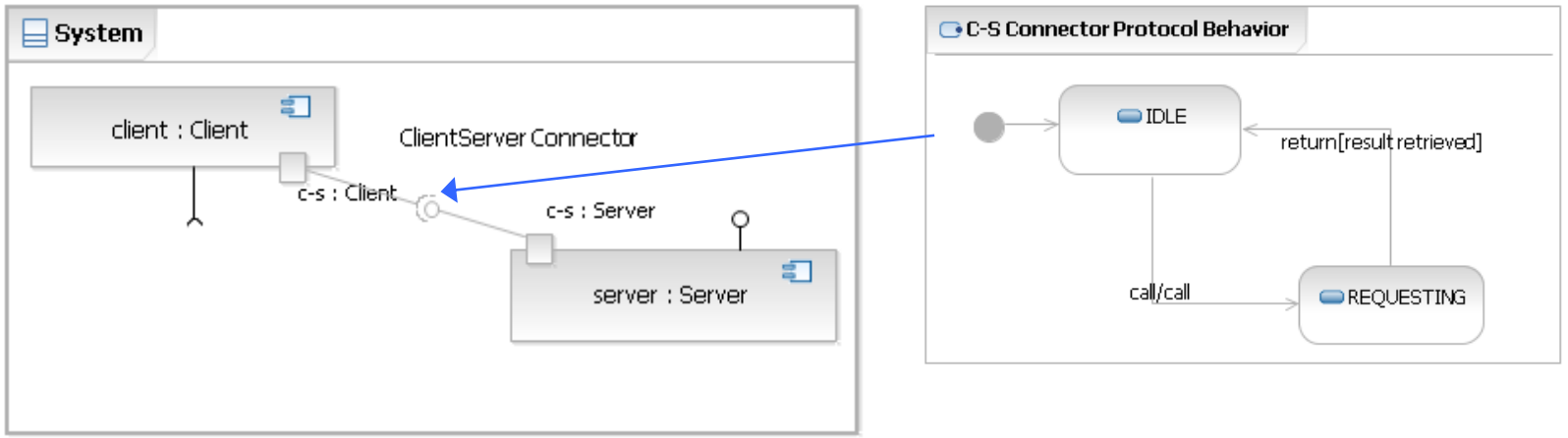
[Source: Microsoft]

Static Structures

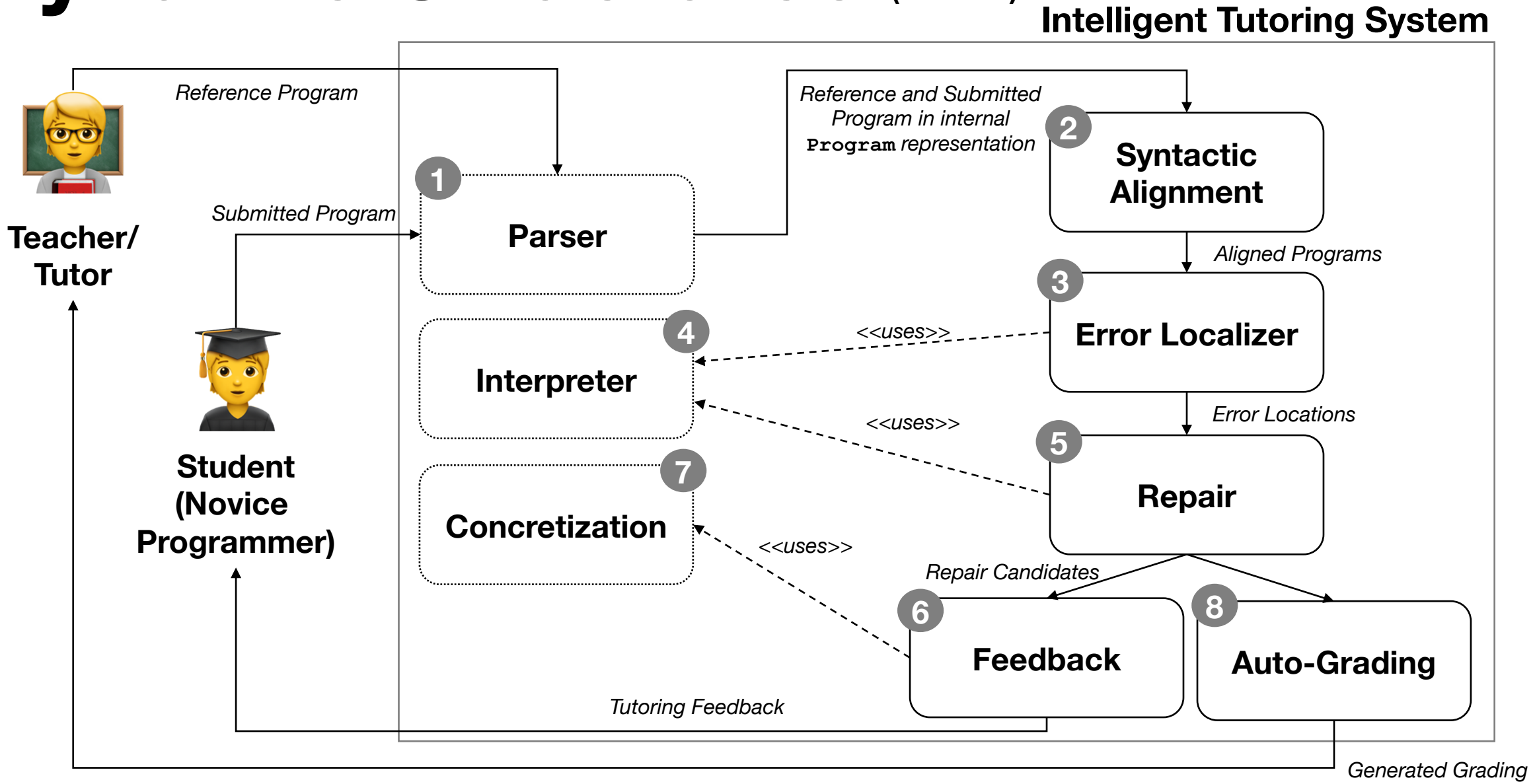


Dynamic Structures: Focus is On Connectors

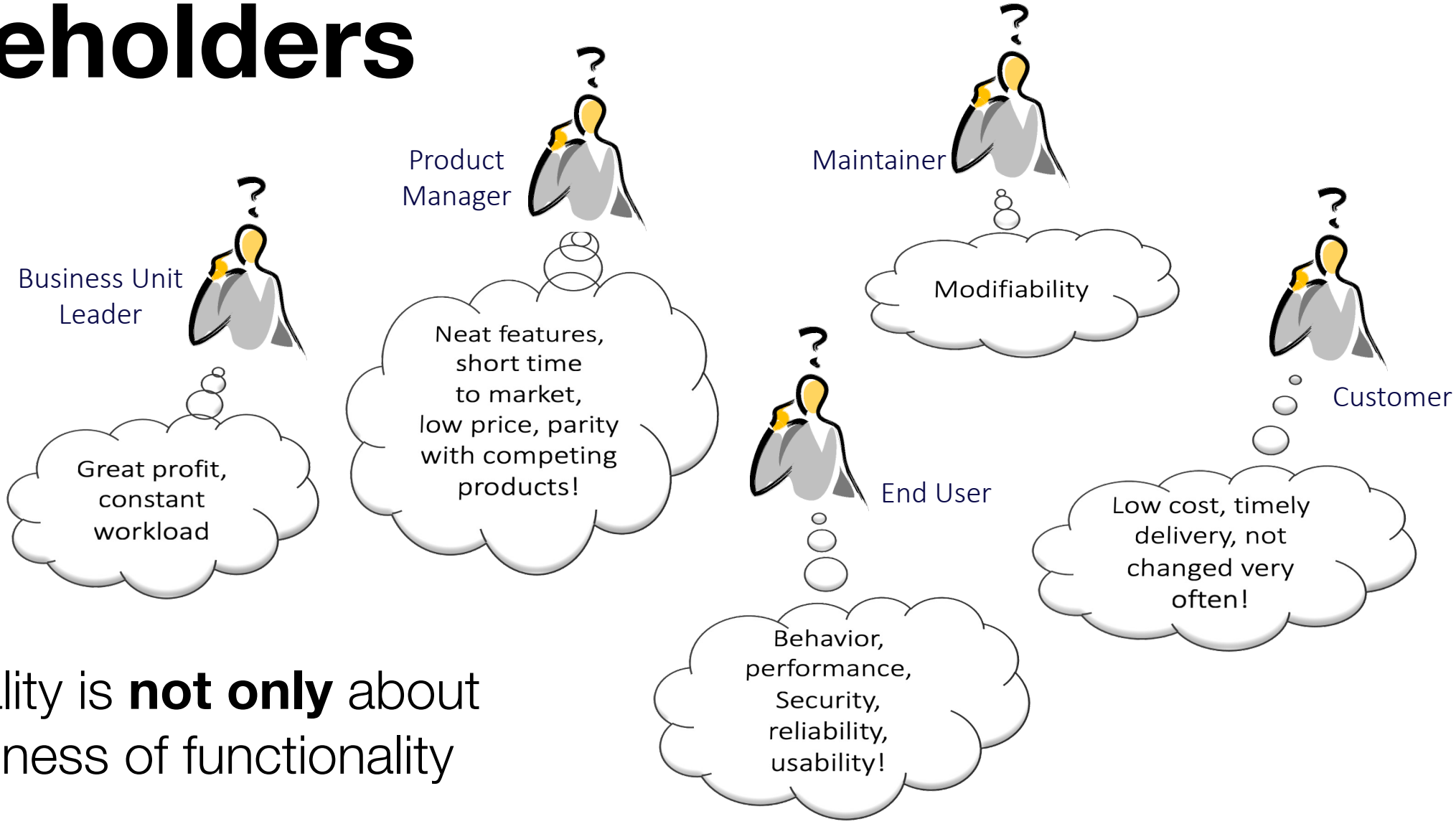
- What is behind relationships?
- How do elements communicate?
- What assumptions do elements make?



Dynamic Structures (informal)



Potential Concerns of Some Stakeholders

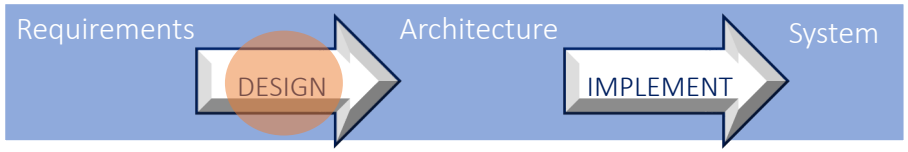


→ Quality is **not only** about correctness of functionality

Architecture Essentials – Design Principles

- ❏ Abstraction
- ❏ Separation of Concerns
- ❏ Decomposition: divide & conquer
- ❏ Modularization: coupling & cohesion
- ❏ Encapsulation: information hiding
- ❏ Well-Defined Interfaces
- ❏ Architectural Styles
  - Pipe-and-Filter
  - Shared-Data
  - Publish-Subscribe
  - Client Server Style
  - Peer-to-Peer Style
  - Communicating-Processes Style

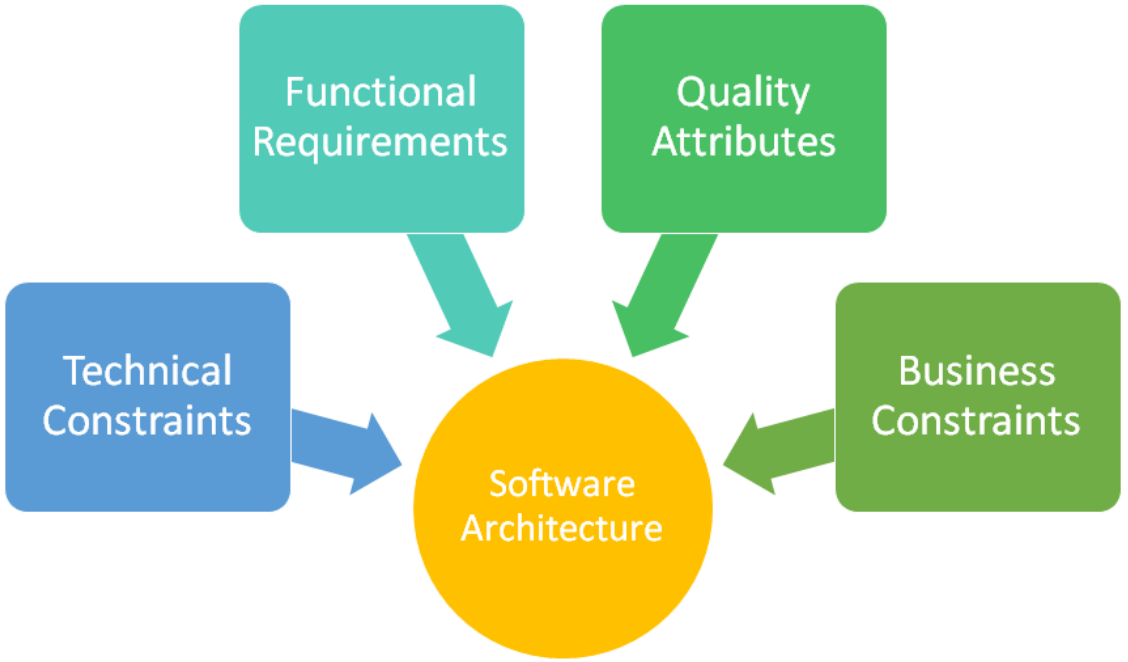
Define Architecture: Design and Communication



- Design is driven by a single architect (or a small group of architects with an identified leader)
- Basic architectural design process
  - Choose the **architectural drivers**
  - Drivers are derived from requirements most highly ranked
  - Drivers thus combine specific set of functional and quality requirements that will dominantly 'shape' the architecture
- Choose an architectural style
- Instantiate module types and allocate functionality

Architectural Drivers

- **Business goals**
  - Customer organization
  - Developing organization
- **Quality attributes**
- **Key functional requirements**
  - Unique properties
  - Make system viable
- **Constraints**
  - Organizational and technical
  - Cost and time



https://medium.com/@janerikfra/architectural-drivers-in-modern-software-architecture-cb7a42527bf2

Conclusion

- ❑ Requirement Analysis, Elicitation, and Modeling **needs training**
- ❑ Next step: entering the **solution space**

Next Week:
Chinese New Year

- ➢ ITS Architecture is already shared
- ➢ Assignment 4:
  (a) Module Design
  (b) Strategy Planning

In two weeks:
Module Design & Project Planning