Software Engineering

CS305, Autumn 2020

Week 6

Class Progress…

- Last week:
  - Logistics: feedback on PA0, PA1 posted
  - Design: Architectural Design and Styles

Class Progress…

- This week:
  - Architecture Styles (continued)
  - Detailed Design

Architectural Styles Recap..

- Popular way of making architectural design decisions to structure the system
- Result in elegant, scalable, evolvable, etc. software solutions

“a family of systems in terms of a <u>pattern of structural organization</u>; a vocabulary of <u>components and connectors</u>, with <u>constraints</u> on how they can be combined” - Shaw and Garlan, 1996

Architectural Styles

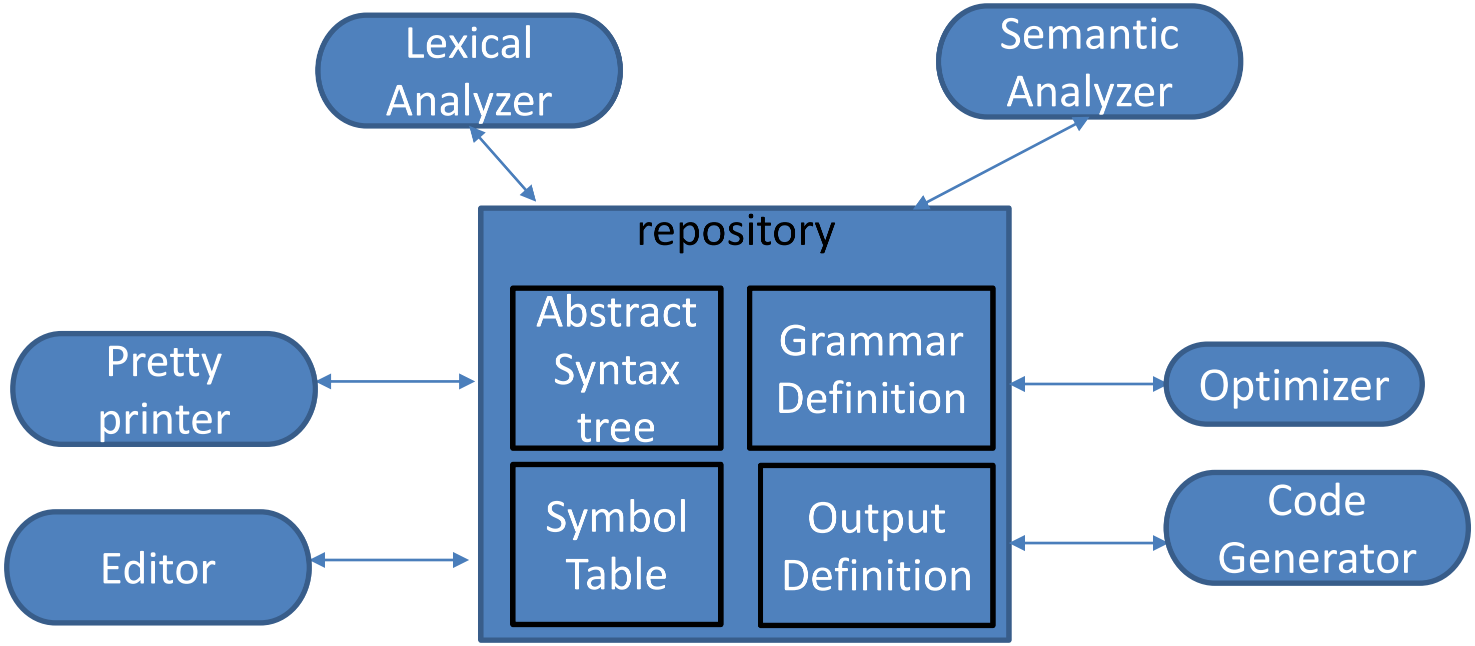
- More widely used styles of structuring a software system
  - Shared data repository Style
  - Shared services and servers style
  - Abstract machine or layered style

Repository Model

- How is data exchanged among subsystems?
  - Data is held in a central Database and all sub-modules access the Database
  - Each submodule maintains its own Database and passes data explicitly to the sub-module that needs it.
- Pros (central Database):
  - Can share large amount of data efficiently
  - Sub-modules are free from the responsibilities of data management
  - Easy integration
- Cons
  - Sub-modules must all agree on a common data model
  - Data evolution is difficult and expensive
  - Customization of data management policies is not possible

Repository Model

- E.g. Language Processing System

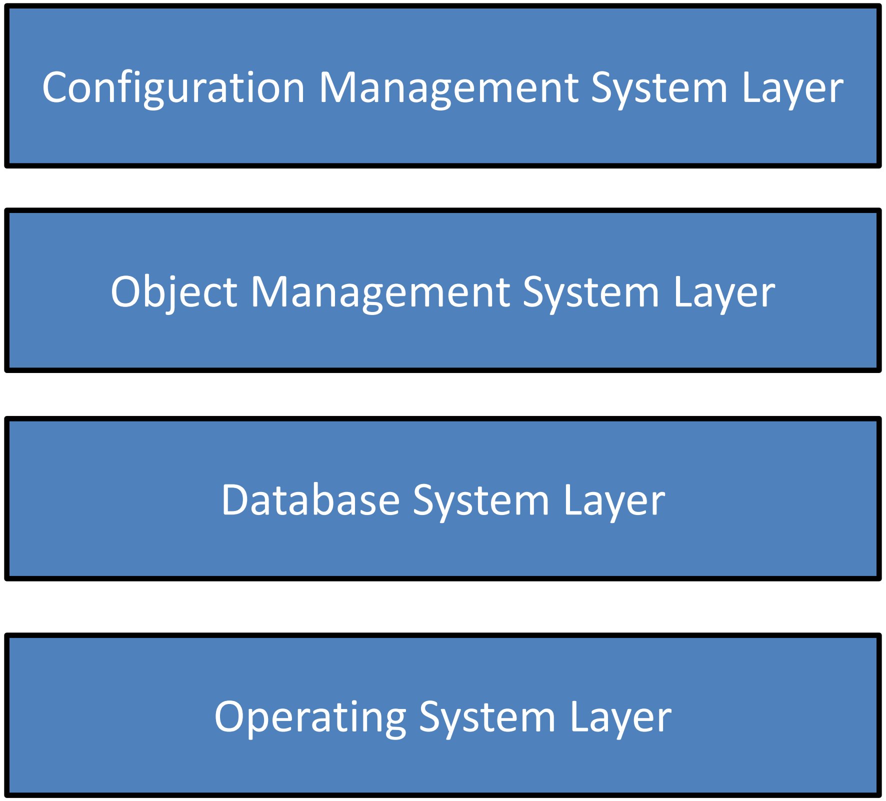


Layered Model

- How are different subsystems interfaced?
  - Each layer provides a specific set of services
- Pros:
  - Supports incremental development of subsystems in different layers.
- Cons:
  - May introduce performance overhead due to layers of abstraction

Layered Model

- E.g. Version Control System



Configuration Management System Layer

Object Management System Layer

Database System Layer

Operating System Layer

Detailed Design

- Is the process of specifying logical behavior of each component
- Typical activities:
  - Algorithm selection
  - Data structure selection
- How is it expressed?
  - Combination of pseudocode, natural language, graphical representation (e.g. behavioral, structural diagrams)

Review – Modeling and UML

Library Information System

- A software system for managing the information resources for a library
- Class Activity: creating a UML class diagram that models the problem
  - Include classes, their attributes and operations and the relationships among them
  - Indicate attribute types, cardinality of associations, generalization and aggregation relationships

Library Information System - Requirements

1. Each patron has one unique library card for as long as they are in the system.
2. The library needs to know at least the name, address, phone number, and library card number for each patron.
3. In addition, at any particular point in time, the library may need to know or to calculate the items a patron has checked out, when they are due, and any outstanding overdue fines.
4. Children (age 12 and under) have a special restriction–they can only check out five items at a time.
5. A patron can check out books or audio/video materials.
6. Books are checked out for three weeks, unless they are current best sellers, in which case the limit is two weeks.
7. A/V materials may be checked out for two weeks.
8. The overdue fine is ten cents per item per day, but cannot be higher than the value of the overdue item.
9. The library also has reference books and magazines, which can't be checked out
10. A patron can request a book or A/V item that is not currently in.
11. A patron can renew an item once (and only once), unless there is an outstanding request for the item, in which case the patron must return it.