GOVERNMENT OF ANDHRA PRADESH

COMMISSIONERATE OF COLLEGIATE EDUCATION

SOFTWARE ARCHITECTURE AND ARCHITECTURAL STYLES

Software Engineering

Computer Science

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Objectives

- Describe the software architecture.
- Importance of software architecture.
- Use of architectural descriptions and decisions.
- Define architecture style.
- Describe various architectural styles.

Software Architecture

- The software architecture is structure or structures of the system
- The architecture is not the operational software, it is a representation that is used to
  1. Meet its stated requirements effectively.
  2. Look for architectural alternatives which makes design changes relatively easy.
  3. Reduce the risks in the construction of the software.
- In the architectural representation software component can be a module, class, database or middle ware configuration.
- The focus is on external relationships among components.

Importance of Software Architecture

- Three reasons that describe the importance of software architecture.
  1. software architecture enables the communication among all the stakeholders.
  2. The architecture focuses on the early design decisions that leads to ultimate success of the system.
  3. The Architecture represents a relatively small, intellectually graspable model of how the system is structured and how its components work together".

Architectural Description

- It is actually a set of work products that reflect different views of the system.
- Architecture can be viewed by different stake holders as
  - The developer views the architecture as guide to proceed with design.
  - Customer wants clear understanding of environment.
  - Other stakeholders see the architecture in different aspects.
- The IEEE standard defines an architectural description (AD) as “a collection of products to document an architecture.”
- The description consist of multiple views, where each view is “a representation of a whole system from the perspective of stakeholder.”

Architectural Decisions

- To represent architecture in different views, architect must look for variety of alternatives.
- Architectural decisions can be considered to be one view of the architecture.
- We must document each major decision.

Architecture Styles

- The software to be built exhibit various architecture styles.
- These styles describes the system as follows
  1. A set of components perform the function required by the system.
  2. A set of connectors used for the communication, coordination and cooperation among the components.
  3. The constraints defined for the integration of components to form the system.
  4. Semantic models used to understand the overall properties of a system.

Taxonomy of Architectural Styles

- computer systems are categorized into one of the following architectural styles.
  1. Data-centered architecture
  2. Flow-control architecture
  3. Call and return architecture
  4. Object-oriented architecture
  5. Layered architecture

Data-centered Architecture

- The data store that is file or database is located at the center of the architecture.
- It is accessed by other components that modify, add, delete data at data store.
- Client software can access the datastore to perform various operations.

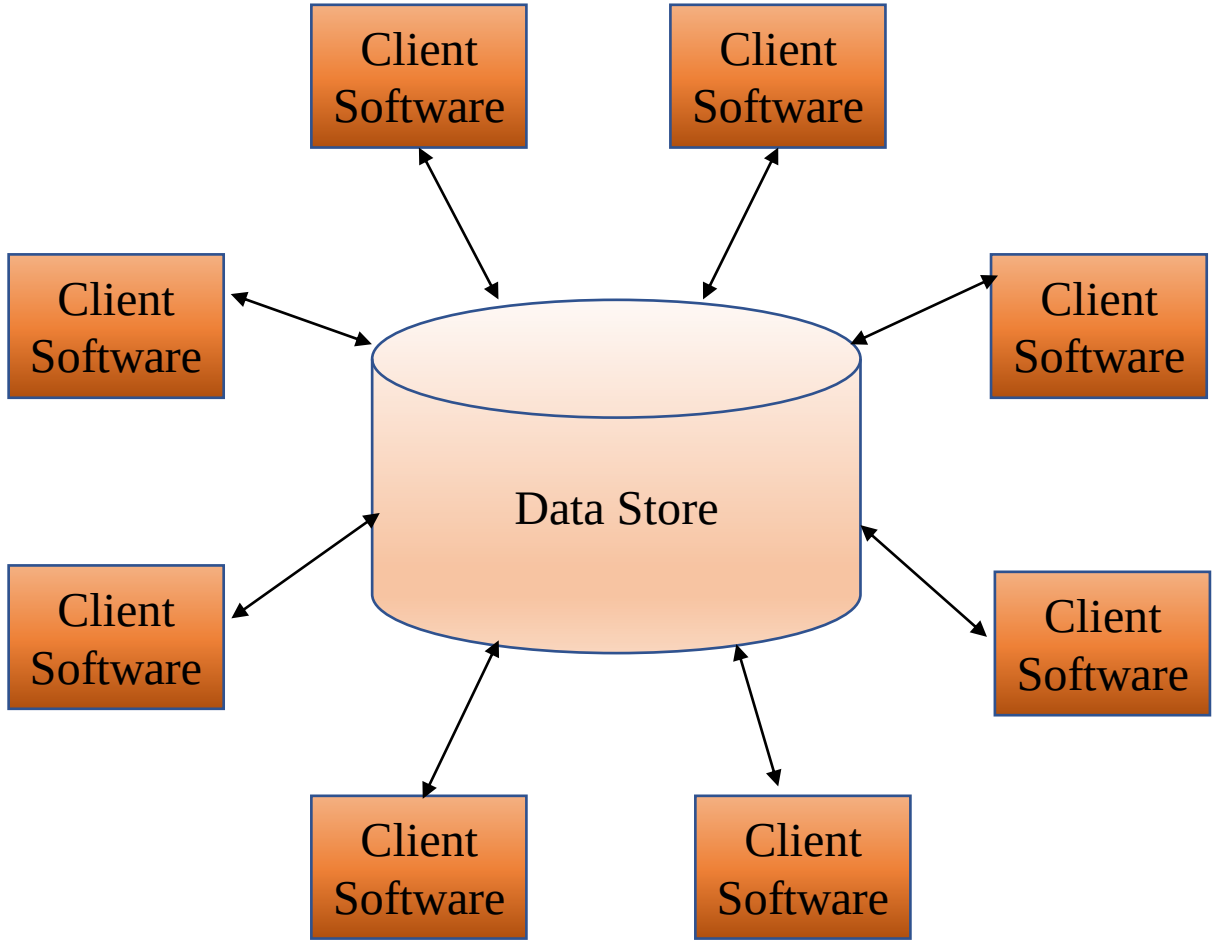

Figure: Data-centered Architecture

Data-flow Architecture

- This architecture style is applied when input data are to be transformed into output data through a series of computational components.
- Pipe and filter pattern is best example for this architecture style.
- It contains set of components called as filters, connected by pipes transforms data from one component to next.
- Each filter works independently and takes data of one form and transform it into another form.

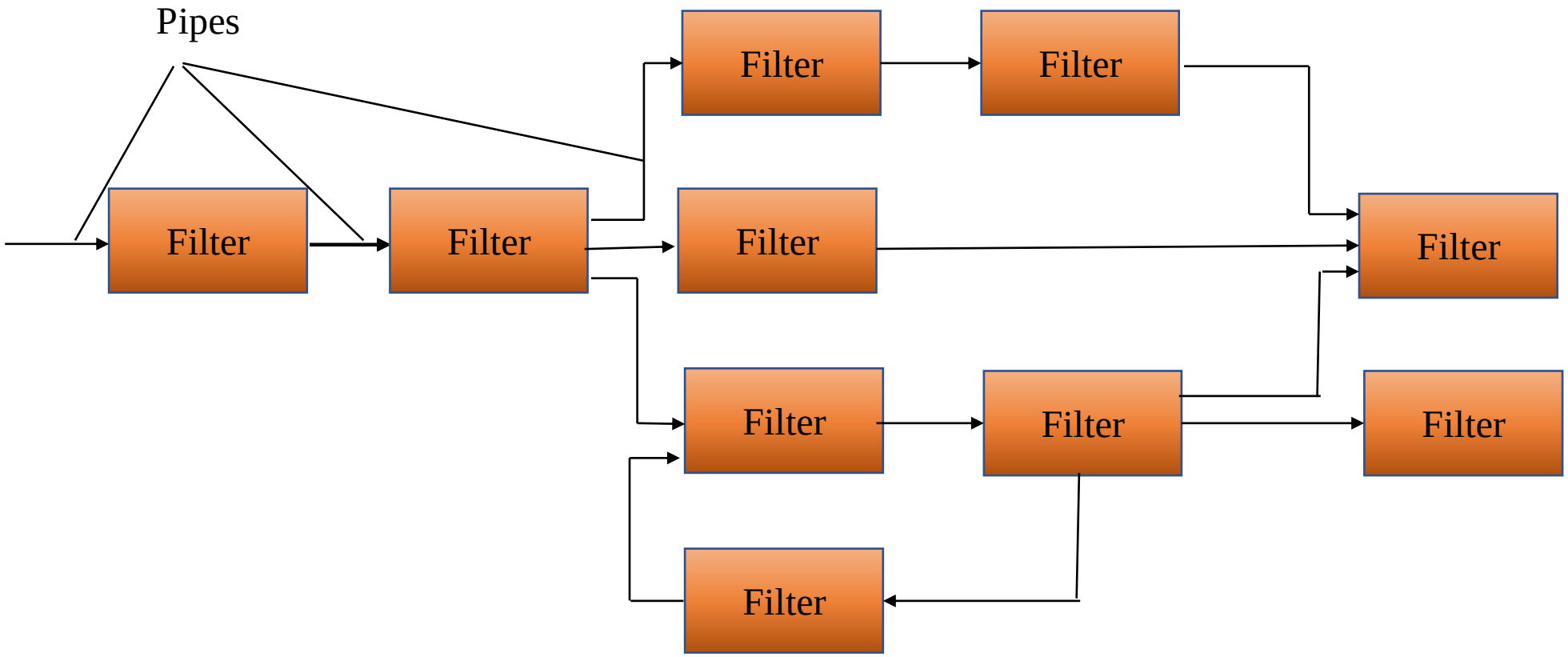

Figure: Data-flow Architecture

Call and Return Architecture

- This architecture style allows to easily modify and scale the structure.
- Following are the sub styles exist in this category.
- Main program or subprogram architecture.
  - The program is divided into smaller pieces hierarchically,
  - The main program invokes many of program components, they in turn may invoke other components.
- Remote procedure call architecture
  - The components of main program or subprogram are distributed across the in network, to increase system performance

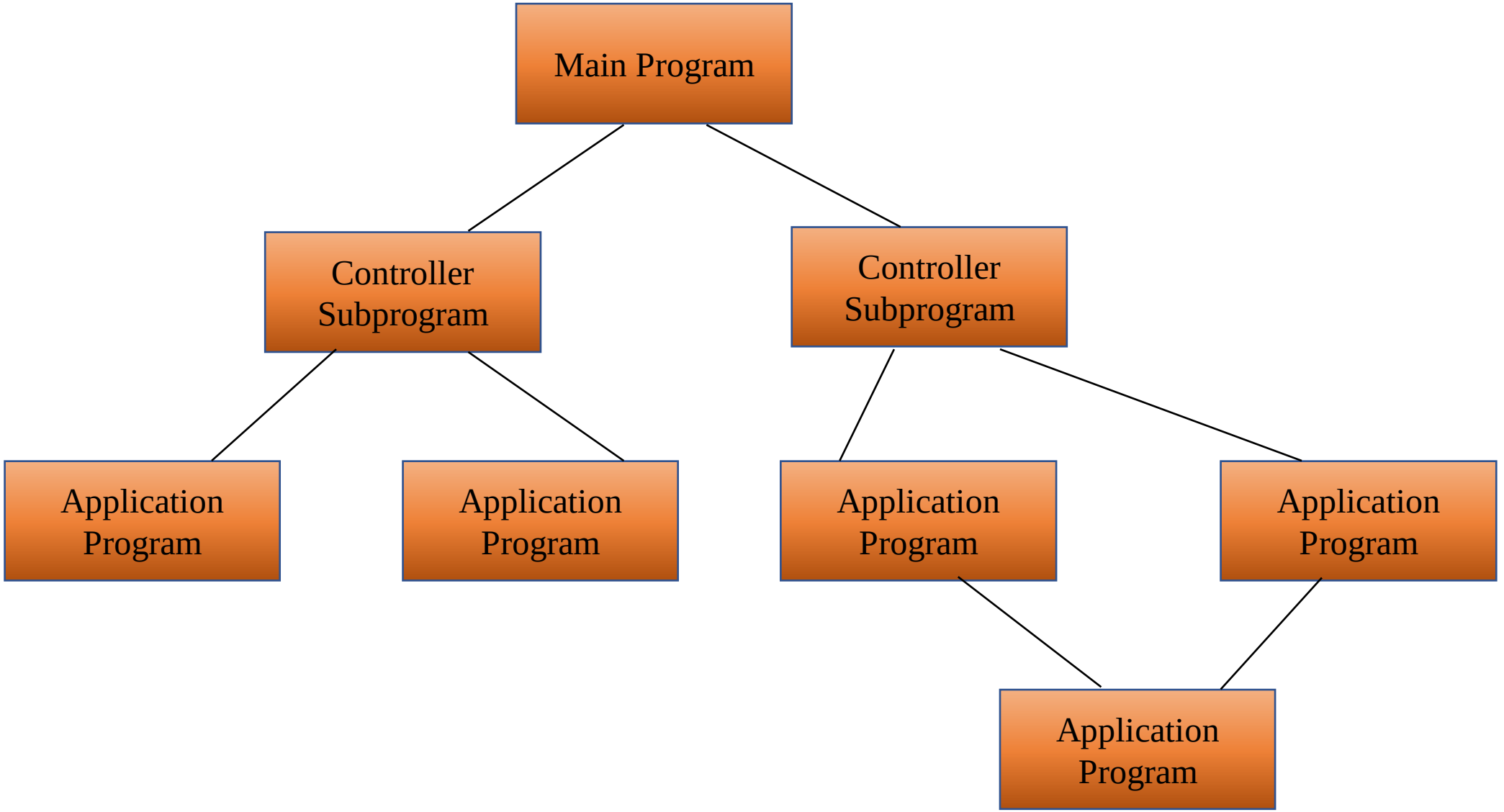

Figure: Main Program/Subprogram Architecture

Object-oriented Architecture

- The components of the system encapsulates both data and operations.
- The communication and coordination among the components takes place via message passing.

Layered Architecture

- Different layers are defined, each perform their own operation and are progressively close to machine instructions.
- Outer layer deals with interface operations.
- Intermediate layer provide application program and utility services.
- Inner layer deals with operating system functions.

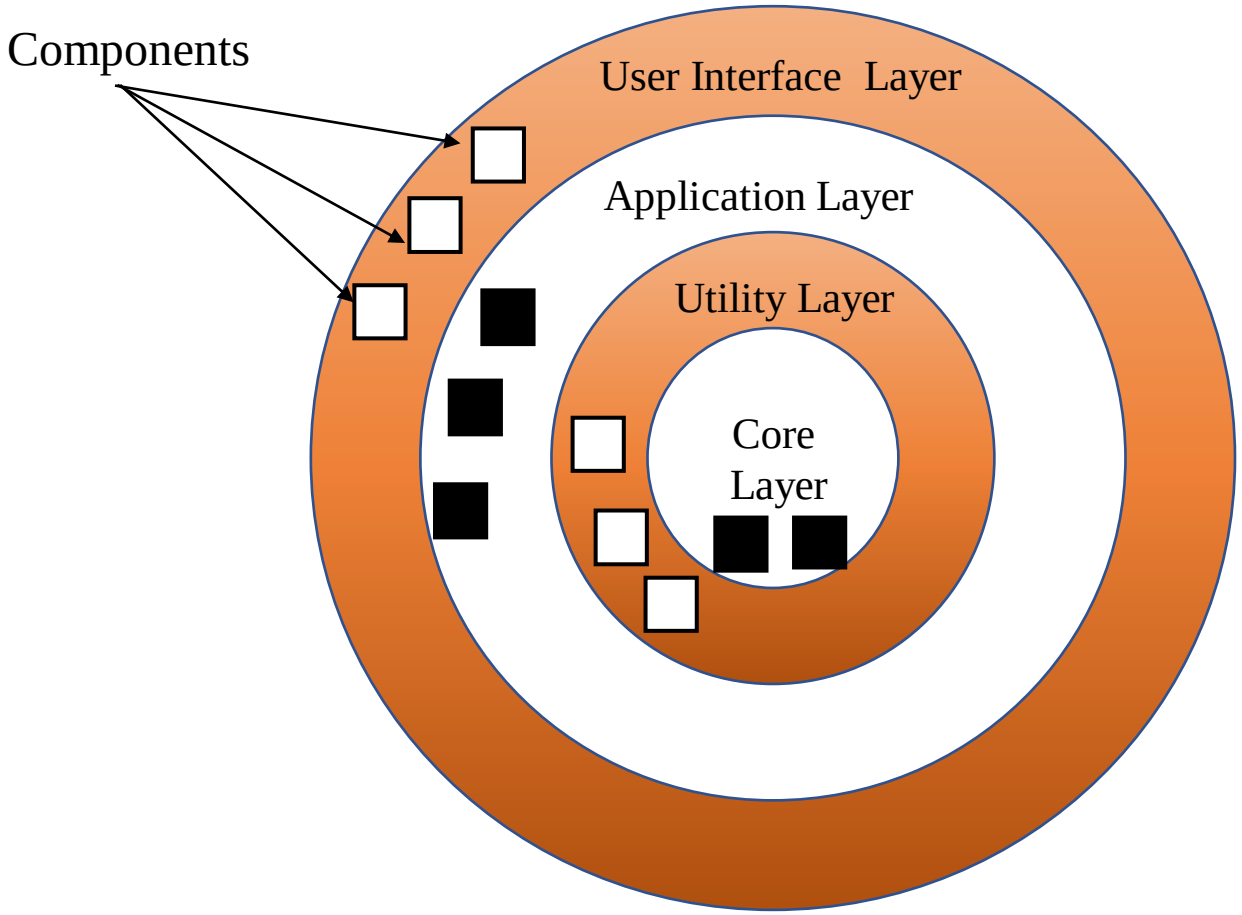

Figure: Layered Architecture

Summary

- Software architecture is structure or structures of system.
- Architectural descriptions are the set of work products from multiple view points.
- Data cantered architecture, the data store is accessed by other components.
- Flow control architecture focus on how input data transformed into other form.
- Call and return architecture divides the program into pieces hierarchically.
- Object oriented architecture define components and their interaction is via message passing.
- Layered architecture defines different layers and they are progressively close to machine instruction set.

References

Text Books:

1. Roger Pressman S., “Software Engineering: A Practitioner's Approach”, 7th Edition, McGraw Hill, 2010.
2. Sommerville, “Software Engineering”, Eighth Edition, Pearson Education, 2007

Web Links:

1. https://cdn.shopify.com/s/files/1/0457/4009/7694/files/software_engineering_pdf_pressman_7th_edition.pdf
2. https://cs.uwaterloo.ca/~a78khan/cs446/lectures/2011_05-may_16_IntroductionToArchitecture-GarlanAndShaw.pdf
3. https://www.ida.liu.se/~chrke55/courses/SWE/F12-SoftwArchitectureSystems.pdf

Thank You

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