SFWR ENG 3A04: Software Design II

Dr. Ridha Khedri

Department of Computing and Software, McMaster University
Canada L8S 4L7, Hamilton, Ontario

Term 1

Outline of Part I

1. Questions???

Outline of Part II

2. Overview
3. Where does software design sit in SDLC?
4. What is meant by Software Architecture?
5. Software Architecture Design Guidelines

Part I

Review of Previous Lecture

Part II

Today's Lecture

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Introduction to Software Architecture Overview

- During the last half centery, the world witnessed growth in the scale, complexity, and space distribution of software systems

Introduction to Software Architecture Overview

- During the last half centery, the world witnessed growth in the scale, complexity, and space distribution of software systems
- When a system is complex in its functionality, its aspects (qualities), and its environment, an obvious need to reduce that complexity emerges

Introduction to Software Architecture Overview

- During the last half centery, the world witnessed growth in the scale, complexity, and space distribution of software systems
- When a system is complex in its functionality, its aspects (qualities), and its environment, an obvious need to reduce that complexity emerges
- A top-down strategy in software construction to divide and conquer the complexities faced by the constructors

- During the last half centery, the world witnessed growth in the scale, complexity, and space distribution of software systems
- When a system is complex in its functionality, its aspects (qualities), and its environment, an obvious need to reduce that complexity emerges
- A top-down strategy in software construction to divide and conquer the complexities faced by the constructors
- Roughly speaking, the decomposition of a system/artifact into "manageable" parts is one of aims of design

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is Design?

- One cannot define design as would define a mathematical activity such as “rewriting“, “derivation”, etc.

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is Design?

- One cannot define design as would define a mathematical activity such as “rewriting“, “derivation”, etc.

- The nature of design is not easy to grasp in a clear definition

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is Design?

- One cannot define design as would define a mathematical activity such as “rewriting“, “derivation”, etc.
- The nature of design is not easy to grasp in a clear definition
- Looking for a definition of design may not help you grasp what it is

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is Design?

- One cannot define design as would define a mathematical activity such as “rewriting“, “derivation”, etc.
- The nature of design is not easy to grasp in a clear definition
- Looking for a definition of design may not help you grasp what it is
- Design can be seen in any human artefact and in nature

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is Design?

- One cannot define design as would define a mathematical activity such as "rewriting", "derivation", etc.
- The nature of design is not easy to grasp in a clear definition
- Looking for a definition of design may not help you grasp what it is
- Design can be seen in any human artefact and in nature
- The single word "design" encompasses an awful lot of objectives and subjective aspects

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- They can be

- They can be
  - aesthetic (subjective)

- They can be
  - aesthetic (subjective)
  - functional (Objective)

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- They can be
  - aesthetic (subjective)
  - functional (Objective)
  - many other aspects of an object or a process (Objective or subjective), which usually requires considerable
    - research,
    - thought,
    - modeling,
    - interactive adjustment,
    - and re-design

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Depending on the designed entity, either the objective or the subjective aspects might takeover

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Depending on the designed entity, either the objective or the subjective aspects might takeover
- When the subjective aspects take over, design is then viewed as a more rigorous form of art, or art with a clearly defined purpose

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Depending on the designed entity, either the objective or the subjective aspects might takeover
- When the subjective aspects take over, design is then viewed as a more rigorous form of art, or art with a clearly defined purpose
- When the objective aspects take over, design is then viewed as a simple mathematical transformation of the mathematical entities expressing the functional requirements into a design which is a collection of mathematical entities with their mathematical connectors

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Depending on the designed entity, either the objective or the subjective aspects might takeover
- When the subjective aspects take over, design is then viewed as a more rigorous form of art, or art with a clearly defined purpose
- When the objective aspects take over, design is then viewed as a simple mathematical transformation of the mathematical entities expressing the functional requirements into a design which is a collection of mathematical entities with their mathematical connectors
- So, design involves both mathematics and art as transformation means (and may be other skills?!!!)

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Example

Design as a mathematical activity Construction a *deterministic finite automaton* (DFA) that accepts all binary strings with an even number of 0's and the number of 1's is a multiple of 3.

Design Process: Let $L(M_3)$ be the language that contains only all binary strings with an even number of 0's and the number of 1's is a multiple of 3.

$$
\begin{aligned}
& L(M_3) \\
= & \quad \langle \text{ From the textual description of the languages as given by the question. } \rangle \\
& \{x \mid x \in \{0,1\}^* \ \wedge \ x \text{ contains even number of 0's} \\
& \wedge \ x \text{ contains a number of 1's that is multiple of 3}\} \\
= & \quad \langle \text{ Definition of set intersection } \rangle \\
& \{x \mid x \in \{0,1\}^* \ \wedge \ x \text{ contains even number of 0's}\} \\
& \cap \{x \mid x \in \{0,1\}^* \ \wedge \ x \ \wedge \ \text{ contains a number of 1's that is multiple of 3}\}
\end{aligned}
$$

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Example

From the above derivation, we can notice that $L(M_3)$ is the intersection of two languages:

1. $L(M_1) = \{x \mid x \in \{0,1\}^* \ \wedge$
   x contains even number of 0's$\}$
2. $L(M_2) = \{x \mid x \in \{0,1\}^* \ \wedge \ x \ \wedge$
   contains a number of 1's that is multiple of 3$\}$

$L(M_1)$ and $L(M_2)$ are regular since they are accepted by the machine M_1 and M_2, respectively.
Since $L(M_3) = L(M_1) \cap L(M_2)$, then M_3 can be obtained from M_1 and M_2 using the product construction.

Example

Continued ...

Product construction:

1. $Q_3 = \{\alpha, \beta\} \times \{a, b, c\} = \{(\alpha, a), (\alpha, b), (\alpha, c), (\beta, a), (\beta, b), (\beta, c)\}$
2. $\Sigma = \{0, 1\}$
3. $s_3 = (s_1, s_2) = (\alpha, a)$
4. $F_3 = F_1 \times F_2 = \{\alpha\} \times \{a\} = \{(\alpha, a)\}$
5. δ_3 is given by the following table.

	0	1
(α, a)	(β, a)	(α, b)
(α, b)	(β, b)	(α, c)
(α, c)	(β, c)	(α, a)
(β, a)	(α, a)	(β, b)
(β, b)	(α, b)	(β, c)
(β, c)	(α, c)	(β, a)

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Example

Continued ...

The graphical representation of M_3.

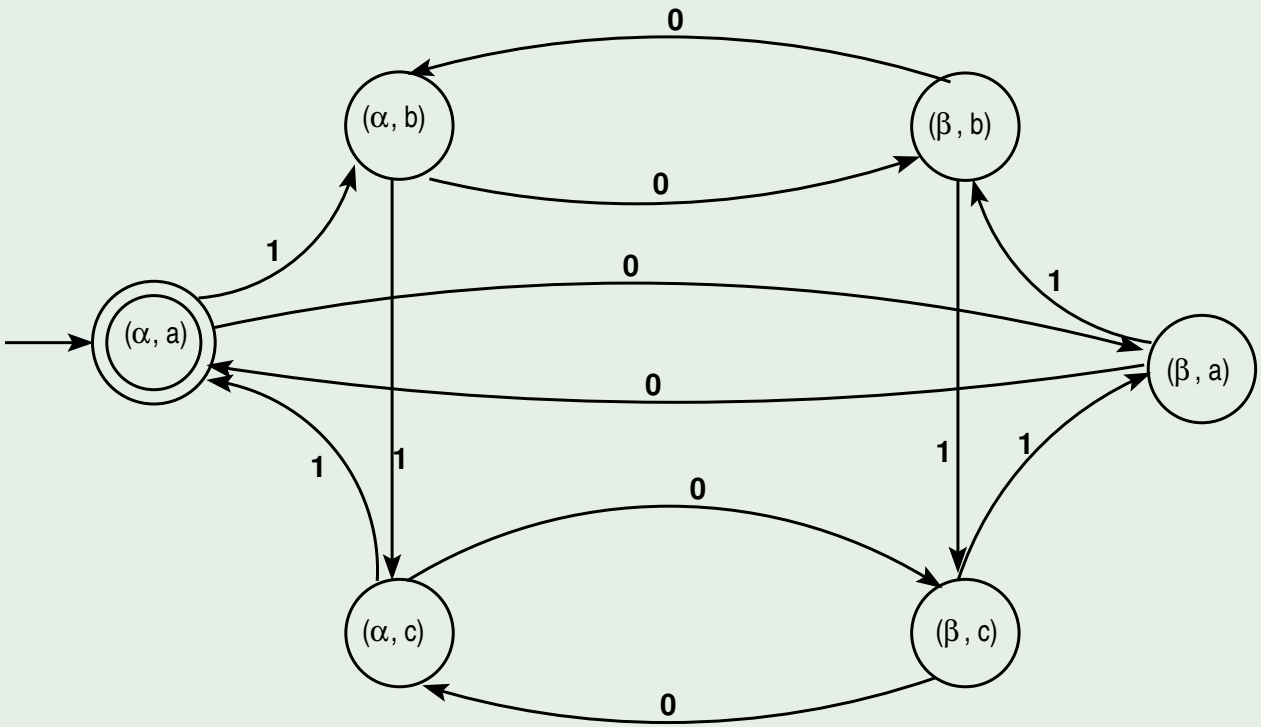

Figure: Machine M_3 (The product of M_1 and M_2)

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Example

Design as an artistic activity

Figure: Game Interface

Example

Design as an artistic activity (Continued...)

Figure: Game Interface

In the literature, you find some unsuccessful attempts to define the term design:

- In some literature, you find that design is "making things better for people"

In the literature, you find some unsuccessful attempts to define the term design:

- In some literature, you find that design is "making things better for people"
- But, for instance, we all could say that we too "make things better for people"!!!!!!!

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

In the literature, you find some unsuccessful attempts to define the term design:

- In some literature, you find that design is "making things better for people"
- But, for instance, we all could say that we too "make things better for people"!!!!!!!
- "Design is that area of human experience, skill and knowledge which is concerned with man's ability to mould his environment to suit his material and spiritual needs."
  [Archer, B (1973) The Need for Design Education. Royal College of Art]

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Design could be viewed as an activity that translates an idea/goal/wish into a blueprint for an artefact or a process that is fit for its environment

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Design could be viewed as an activity that translates an idea/goal/wish into a blueprint for an artefact or a process that is fit for its environment
- We will focus on examples of design that would give each one of us his/her own understanding of design (which enhances creativity)

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Design could be viewed as an activity that translates an idea/goal/wish into a blueprint for an artefact or a process that is fit for its environment
- We will focus on examples of design that would give each one of us his/her own understanding of design (which enhances creativity)
- We however agree that the obtained artefact or process is suitable for (fit for use in) the intended environment

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is in design more than the translation of an idea to an artefact or process?

- Design can be seen as an activity of reconciliation between conflicting needs or constraints put by the environment

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is in design more than the translation of an idea to an artefact or process?

- Design can be seen as an activity of reconciliation between conflicting needs or constraints put by the environment
- Design is a creative process based around the "building up" of ideas

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is in design more than the translation of an idea to an artefact or process?

- Design can be seen as an activity of reconciliation between conflicting needs or constraints put by the environment
- Design is a creative process based around the "building up" of ideas
  - Avoiding negative judgments of contributors when designing eliminates the fear of failure and encourages maximum input and participation

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is in design more than the translation of an idea to an artefact or process?

- Design can be seen as an activity of reconciliation between conflicting needs or constraints put by the environment
- Design is a creative process based around the "building up" of ideas
  - Avoiding negative judgments of contributors when designing eliminates the fear of failure and encourages maximum input and participation
  - Encourage outside the box thinking in this process since this can often lead to creative solutions

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Although design is subject to personal taste, design thinkers share a common set of values that drive innovation

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Although design is subject to personal taste, design thinkers share a common set of values that drive innovation

- These values are mainly creativity, fertile imagination, "whole brain thinking", teamwork, end-user focus, curiosity

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- Although design is subject to personal taste, design thinkers share a common set of values that drive innovation
- These values are mainly creativity, fertile imagination, "whole brain thinking", teamwork, end-user focus, curiosity
- The design thinking process should evolve through the following stages: define, research, ideate, prototype, choose, implement, and learn

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- A bad software design may result in

- A bad software design may result in
  - a poor quality software product which does not meet user requirement,

- A bad software design may result in
  - a poor quality software product which does not meet user requirement,
  - A system that is not adaptive to any further requirement changes

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- A bad software design may result in
  - a poor quality software product which does not meet user requirement,
  - A system that is not adaptive to any further requirement changes
  - A system that is not reusable

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- A bad software design may result in
  - a poor quality software product which does not meet user requirement,
  - A system that is not adaptive to any further requirement changes
  - A system that is not reusable
  - A system that has unpredictable behavior

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- A bad software design may result in
  - a poor quality software product which does not meet user requirement,
  - A system that is not adaptive to any further requirement changes
  - A system that is not reusable
  - A system that has unpredictable behavior
  - A system that has poor performance

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- A bad software design may result in
  - a poor quality software product which does not meet user requirement,
  - A system that is not adaptive to any further requirement changes
  - A system that is not reusable
  - A system that has unpredictable behavior
  - A system that has poor performance
  - Software production itself may be very ineffective in terms of time and cost

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- A good software design

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- A good software design
  - Reduces risks in software production

- A good software design
  - Reduces risks in software production
  - Coordinates development teams to work together orderly

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- A good software design
  - Reduces risks in software production
  - Coordinates development teams to work together orderly
  - Makes the system traceable for implementation and testing

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

- A good software design
  - Reduces risks in software production
  - Coordinates development teams to work together orderly
  - Makes the system traceable for implementation and testing
  - Allows the software product to have better overall system-qualities (quality attributes)

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Where does software design sit in SDLC?

Software Development Life Cycle (SDLC)

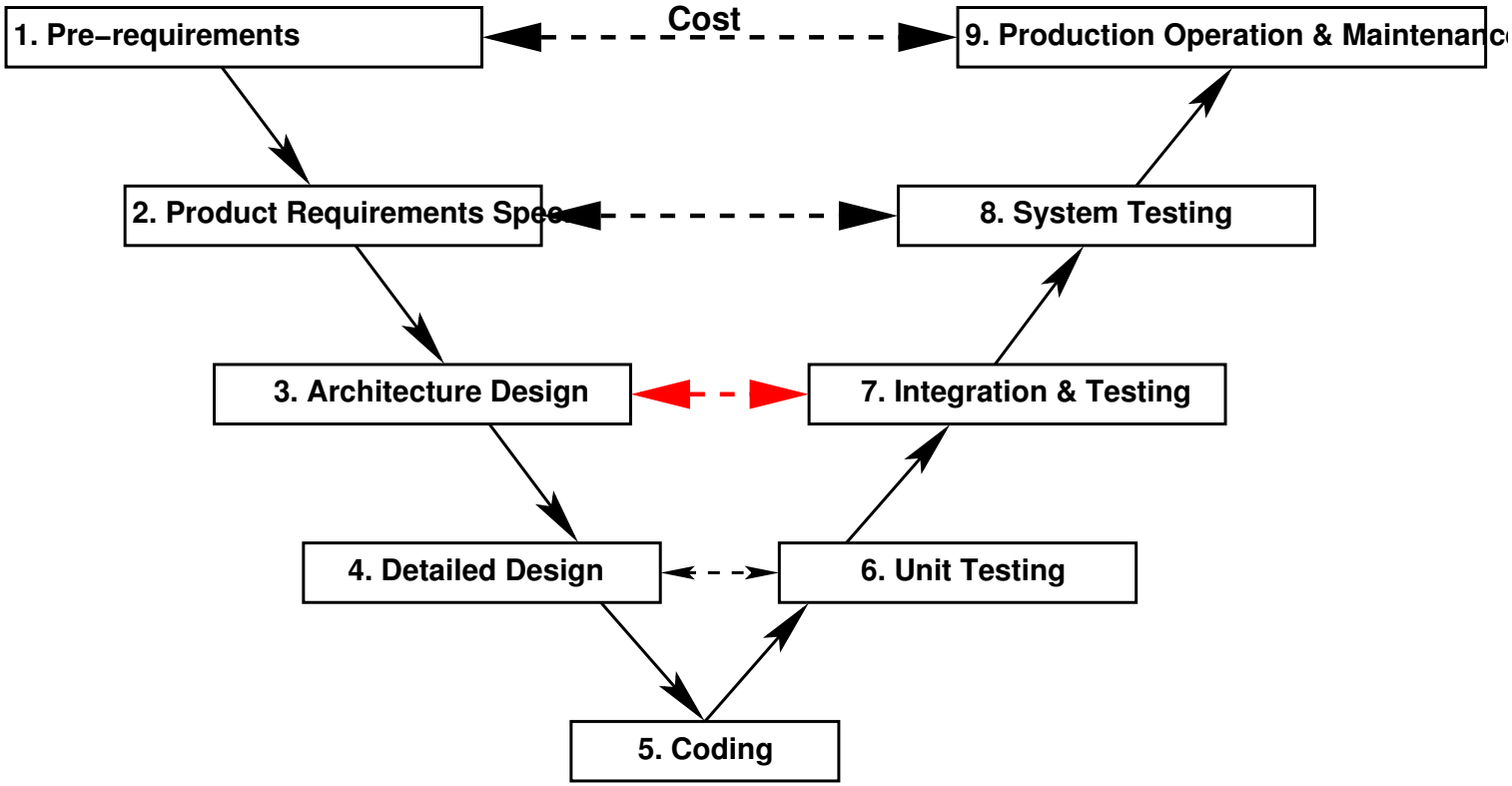

Figure: Software Process V-model

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Introduction to Software Architecture What is meant by Software Architecture?

- Software architecture can be seen as a blueprint guideline for developing a large and complex software system based on the software requirement analysis specification

Introduction to Software Architecture What is meant by Software Architecture?

- Software architecture can be seen as a blueprint guideline for developing a large and complex software system based on the software requirement analysis specification
- The architecture highlights early design decisions that have a decisive impact on the ultimate success of software products

Introduction to Software Architecture What is meant by Software Architecture?

- Software architecture can be seen as a blueprint guideline for developing a large and complex software system based on the software requirement analysis specification
- The architecture highlights early design decisions that have a decisive impact on the ultimate success of software products
- Must be included in a high level design called "software architecture"

Introduction to Software Architecture What is meant by Software Architecture?

- Software architecture can be seen as a blueprint guideline for developing a large and complex software system based on the software requirement analysis specification
- The architecture highlights early design decisions that have a decisive impact on the ultimate success of software products
- Must be included in a high level design called "software architecture"
  - The specializations of software elements

Introduction to Software Architecture What is meant by Software Architecture?

- Software architecture can be seen as a blueprint guideline for developing a large and complex software system based on the software requirement analysis specification
- The architecture highlights early design decisions that have a decisive impact on the ultimate success of software products
- Must be included in a high level design called "software architecture"
  - The specializations of software elements
  - Connection types

Introduction to Software Architecture What is meant by Software Architecture?

- Software architecture can be seen as a blueprint guideline for developing a large and complex software system based on the software requirement analysis specification
- The architecture highlights early design decisions that have a decisive impact on the ultimate success of software products
- Must be included in a high level design called "software architecture"
  - The specializations of software elements
  - Connection types
  - Set of constraints (space, time, budget, etc.) on how they can be planned

Introduction to Software Architecture What is meant by Software Architecture?

- Software architecture can be seen as a blueprint guideline for developing a large and complex software system based on the software requirement analysis specification
- The architecture highlights early design decisions that have a decisive impact on the ultimate success of software products
- Must be included in a high level design called "software architecture"
  - The specializations of software elements
  - Connection types
  - Set of constraints (space, time, budget, etc.) on how they can be planned
  - Set of desired quality attributes (such as performance)

- However, the proposed architecture can address partially or totally some of the desired quality attributes

What is meant by Software Architecture?

- However, the proposed architecture can address partially or totally some of the desired quality attributes

- Families of architectures that have "similar" choices on element types and connections are very often called architecture style

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is meant by Software Architecture?

- However, the proposed architecture can address partially or totally some of the desired quality attributes
- Families of architectures that have "similar" choices on element types and connections are very often called architecture style
- Each architecture style represents

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is meant by Software Architecture?

- However, the proposed architecture can address partially or totally some of the desired quality attributes
- Families of architectures that have "similar" choices on element types and connections are very often called architecture style
- Each architecture style represents
  - The way the elements are arranged

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is meant by Software Architecture?

- However, the proposed architecture can address partially or totally some of the desired quality attributes
- Families of architectures that have "similar" choices on element types and connections are very often called architecture style
- Each architecture style represents
  - The way the elements are arranged
  - The connections and interactions among the elements

What is meant by Software Architecture?

- However, the proposed architecture can address partially or totally some of the desired quality attributes
- Families of architectures that have "similar" choices on element types and connections are very often called architecture style
- Each architecture style represents
  - The way the elements are arranged
  - The connections and interactions among the elements
  - The control transfer among the elements in the system

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is meant by Software Architecture?

- However, the proposed architecture can address partially or totally some of the desired quality attributes
- Families of architectures that have "similar" choices on element types and connections are very often called architecture style
- Each architecture style represents
  - The way the elements are arranged
  - The connections and interactions among the elements
  - The control transfer among the elements in the system
  - The semantic constraints and behaviors concerning data transfer of the architecture style

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Introduction to Software Architecture What is meant by Software Architecture?

- However, the proposed architecture can address partially or totally some of the desired quality attributes
- Families of architectures that have "similar" choices on element types and connections are very often called architecture style
- Each architecture style represents
  - The way the elements are arranged
  - The connections and interactions among the elements
  - The control transfer among the elements in the system
  - The semantic constraints and behaviors concerning data transfer of the architecture style
  - The quality attributes trade-off

What is meant by Software Architecture?

- A partial list of quality attributes: performance, reliability, portability, usability, security, maintainability, adaptability, usability, etc.

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Introduction to Software Architecture What is meant by Software Architecture?

- A partial list of quality attributes: performance, reliability, portability, usability, security, maintainability, adaptability, usability, etc.
- Quality attributes are closely related to architecture styles

Introduction to Software Architecture What is meant by Software Architecture?

- A partial list of quality attributes: performance, reliability, portability, usability, security, maintainability, adaptability, usability, etc.
- Quality attributes are closely related to architecture styles
- Each architecture style contributes some quality features

Introduction to Software Architecture What is meant by Software Architecture?

- A partial list of quality attributes: performance, reliability, portability, usability, security, maintainability, adaptability, usability, etc.
- Quality attributes are closely related to architecture styles
- Each architecture style contributes some quality features
- An architecture style represents tradeoffs among many conflicting quality attributes

What is meant by Software Architecture?

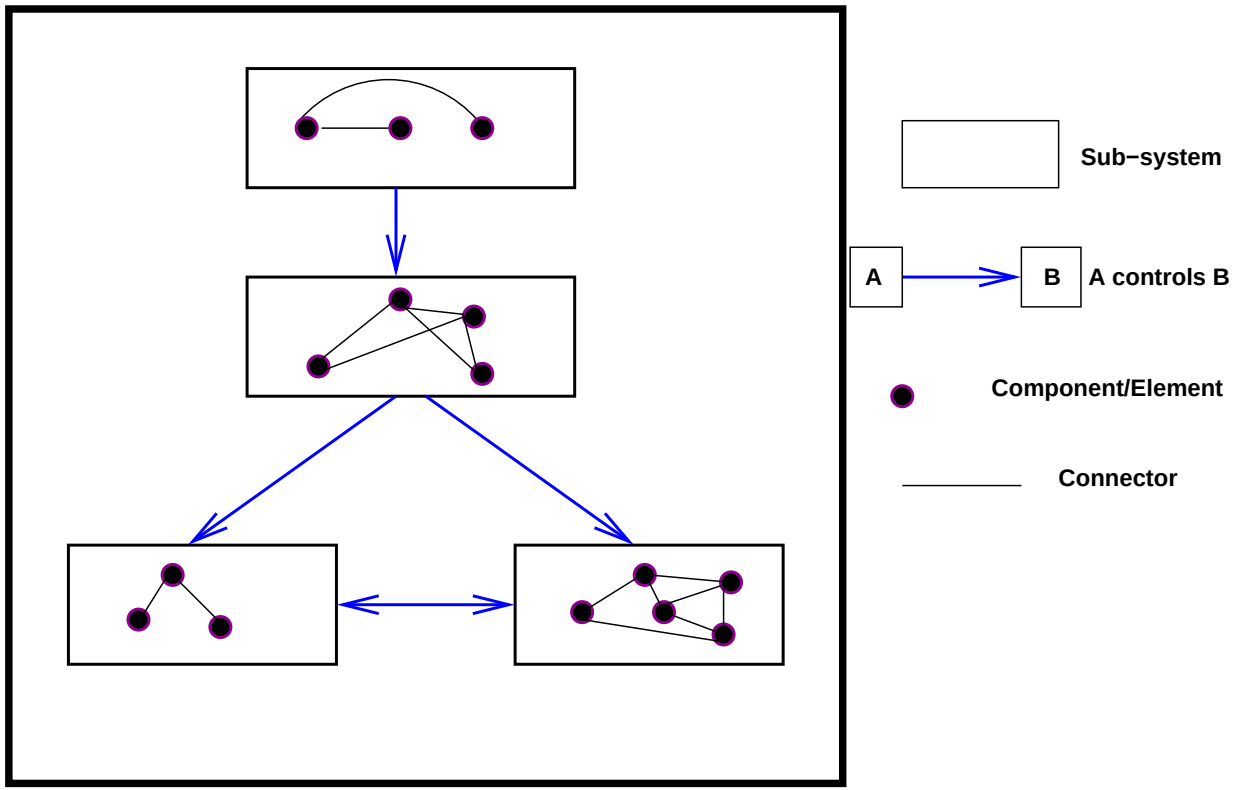

Figure: Rough representation of a software system architecture

Introduction to Software Architecture What is meant by Software Architecture?

- IEEE Std 1471 defines the system architecture as "the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principle guiding its design and evolution"

Introduction to Software Architecture What is meant by Software Architecture?

- IEEE Std 1471 defines the system architecture as "the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principle guiding its design and evolution"

- The basis of a software architecture design is the software requirement specification document

Introduction to Software Architecture What is meant by Software Architecture?

- IEEE Std 1471 defines the system architecture as "the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principle guiding its design and evolution"
- The basis of a software architecture design is the software requirement specification document
- The requirement process covers information domain modeling, data modeling, function modeling, behavioral modeling, and user interface modeling

Introduction to Software Architecture What is meant by Software Architecture?

- IEEE Std 1471 defines the system architecture as "the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principle guiding its design and evolution"
- The basis of a software architecture design is the software requirement specification document
- The requirement process covers information domain modeling, data modeling, function modeling, behavioral modeling, and user interface modeling
- Software requirements has two aspects (functional, non-functional)

Role of the software architect

- System static partitioning and decomposition into sub-systems and communications between sub-systems

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Role of the software architect

- System static partitioning and decomposition into sub-systems and communications between sub-systems
- Establishing dynamic control relationships between different sub-systems in data flow controlling, or control flow orchestration, or message dispatching

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Role of the software architect

- System static partitioning and decomposition into sub-systems and communications between sub-systems
- Establishing dynamic control relationships between different sub-systems in data flow controlling, or control flow orchestration, or message dispatching
- Considering and evaluating all alternative architecture styles for the problem domain

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Introduction to Software Architecture What is meant by Software Architecture?

Role of the software architect

- System static partitioning and decomposition into sub-systems and communications between sub-systems
- Establishing dynamic control relationships between different sub-systems in data flow controlling, or control flow orchestration, or message dispatching
- Considering and evaluating all alternative architecture styles for the problem domain
- Analysis of the trade-off on quality attributes during the selection of architecture styles

Introduction to Software Architecture What is meant by Software Architecture?

- Map a requirement specification to the software architecture and guarantee that the software architecture satisfies all functional and non-functional requirements

What is meant by Software Architecture?

- Map a requirement specification to the software architecture and guarantee that the software architecture satisfies all functional and non-functional requirements
  - There are many kind of traceabilities

What is meant by Software Architecture?

- Map a requirement specification to the software architecture and guarantee that the software architecture satisfies all functional and non-functional requirements
  - There are many kind of traceabilities
  - The architect does backward traceability

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is meant by Software Architecture?

- Map a requirement specification to the software architecture and guarantee that the software architecture satisfies all functional and non-functional requirements
  - There are many kind of traceabilities
  - The architect does backward traceability
  - Might get involved in the forward traceability

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

What is meant by Software Architecture?

- Map a requirement specification to the software architecture and guarantee that the software architecture satisfies all functional and non-functional requirements
  - There are many kind of traceabilities
  - The architect does backward traceability
  - Might get involved in the forward traceability
- If the requirements cannot be practically materialized, system analysts and software architects can go back to stakeholders in order to amend the requirements

- Think of what to do in abstract terms before think of how to do

- Think of what to do in abstract terms before think of how to do
- Think of non-functional requirements as early as possible

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Software Architecture Design Guidelines

- Think of what to do in abstract terms before think of how to do
- Think of non-functional requirements as early as possible
- Think of software reusability and extensibility as much as possible

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Software Architecture Design Guidelines

- Think of what to do in abstract terms before think of how to do
- Think of non-functional requirements as early as possible
- Think of software reusability and extensibility as much as possible
- Try your best to promote the high cohesion within each element and loose-coupling between elements

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Software Architecture Design Guidelines

- Think of what to do in abstract terms before think of how to do
- Think of non-functional requirements as early as possible
- Think of software reusability and extensibility as much as possible
- Try your best to promote the high cohesion within each element and loose-coupling between elements
- ALWAYS keep the design guiding principles in mind when thinking about design

SFWR ENG 3A04: Software Design II

Dr. R. Khedri

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines

Overview

Where does software design sit in SDLC?

What is meant by Software Architecture?

Software Architecture Design Guidelines