

ROBUST SYSTEMS DESIGN

Systems Analysis & Design

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Outline

1 Concepts Generation & Selection



2 Quality Guidelines in Systems Design



3 Systems Architectures



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Concepts Generation

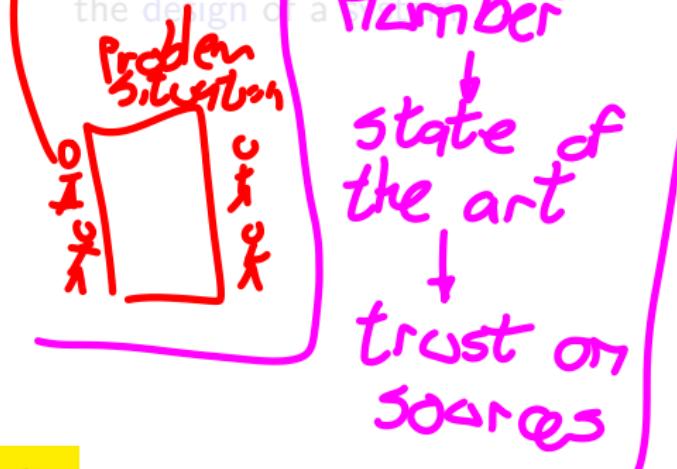
- **Concepts generation** is the process of creating ideas for a system that meet the needs of its users.
- It involves brainstorming, research, and analysis to generate innovative ideas for a system.
- It is a creative process that encourages innovation and creativity in the design of a system.

Problem
Solving



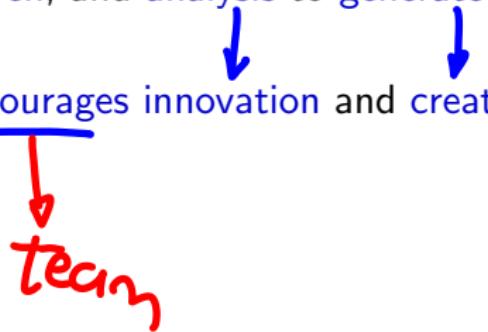
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Innovation and Creativity

- **Innovation** is the process of **creating new ideas** and **solutions** that **improve** the performance of a **system**.
- **Creativity** is the ability to generate original and innovative ideas that solve problems and meet the needs of users.
- They are important for ensuring that a system is robust, efficient, and effective.



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T
solution

T
Resources



Is this Innovation & Creativity?

bluetooth
(10 years
before)



WiiMote-wireless



Concepts Selection

- **Concepts selection** is the process of evaluating and choosing the best ideas for a system.

- It involves analysis, comparison, and evaluation of concepts to determine which ones are the most feasible and effective.

ideas

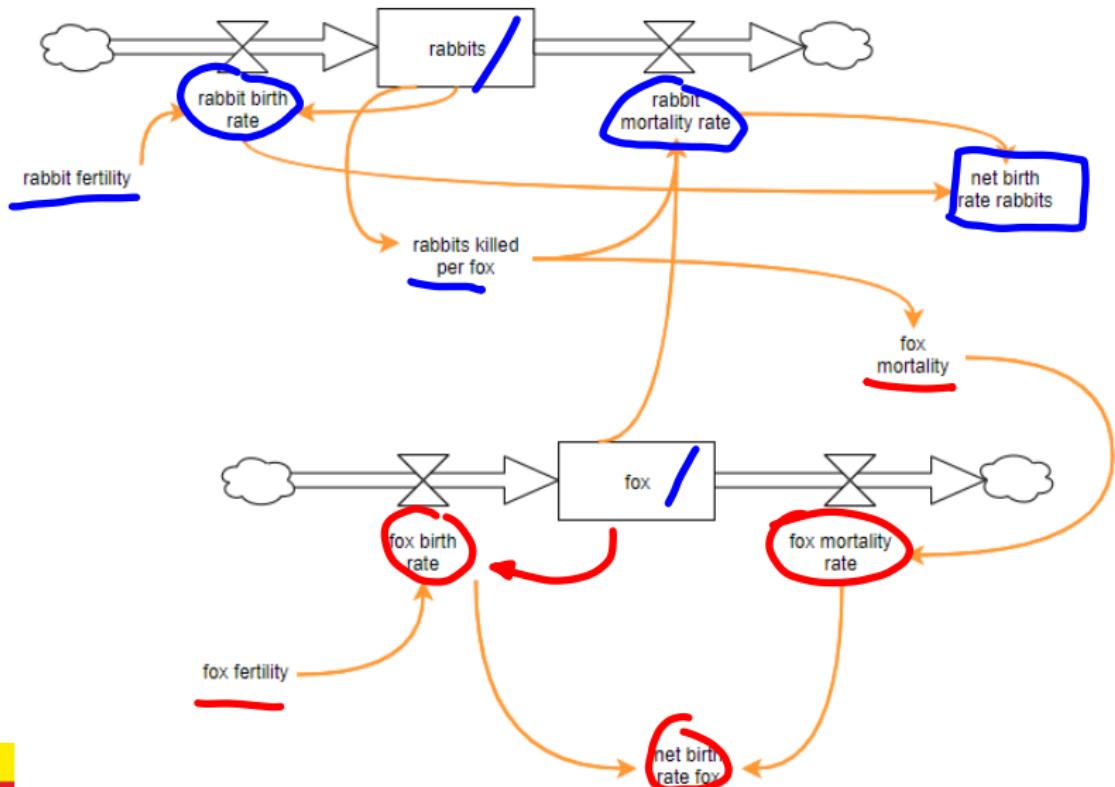
rubric

Fair

Comparison



Stock and Flow Diagram



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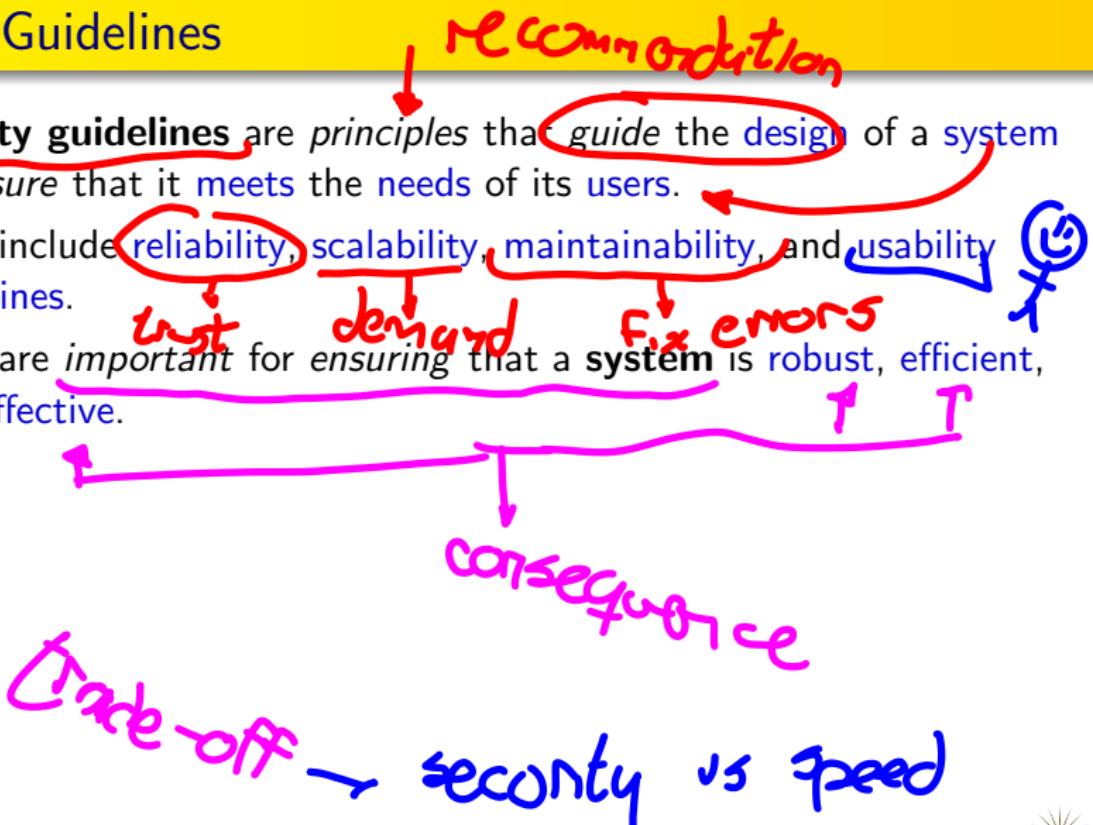
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3 Systems Architectures



Quality Guidelines

- **Quality guidelines** are principles that **guide the design** of a **system** to ensure that it **meets** the **needs** of its **users**.
- They include **reliability**, **scalability**, **maintainability**, and **usability** guidelines.
- They are **important** for ensuring that a **system** is robust, efficient, and effective.



Reliability Guidelines

- Reliability guidelines are principles that guide the design of a system to ensure that it is reliable and dependable.
- They include fault-tolerance, redundancy, and error-handling guidelines.
- They are important for ensuring that a system is robust and resilient to failures.

↑
handles all
the time

try catch
logs



Scalability Guidelines

- **Scalability guidelines** are *principles* that guide the design of a system to ensure that it is **scalable** and **flexible**.
- They include **modularity**, extensibility, and performance guidelines.
- They are *important* for ensuring that a system can grow and adapt to changing requirements.



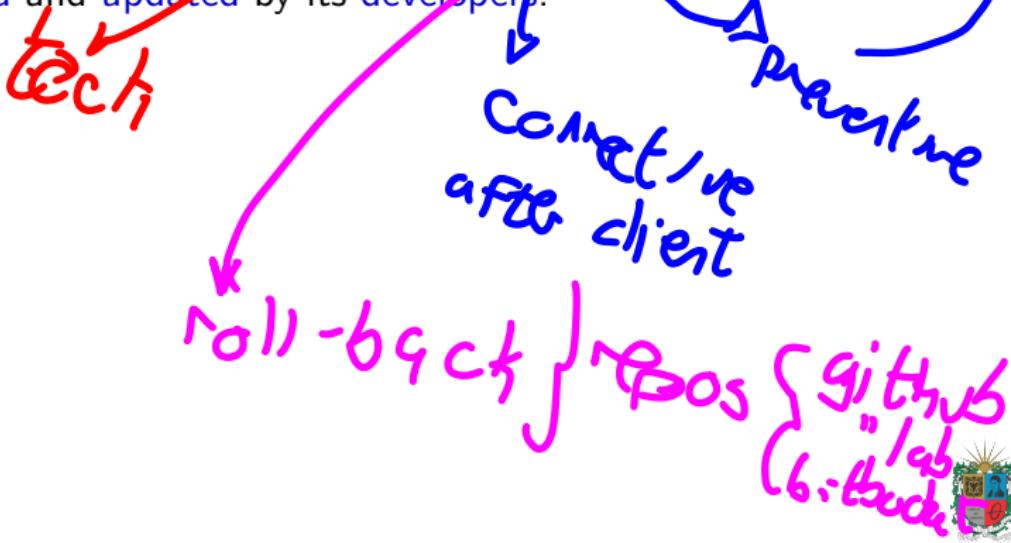
Demand

memory
storage
compute
response
quality
lat request



Maintainability Guidelines

- **Maintainability guidelines** are *principles* that *guide* the design of a system to ensure that it is easy to **maintain** and **update**.
- They include **modularity**, documentation, and **versioning** guidelines.
- They are *important* for ensuring that a system can be easily maintained and updated by its **developers**.



Quality Standards

- Quality standards are benchmarks that define the level of quality that a system must meet.
- They include ISO 9000, CMMI, and Six Sigma standards.

Product entry, use process



ISO 9000

- ISO 9000 is a quality standard that defines the requirements for a quality management system.
- It is designed to help organizations ensure that they meet the needs of their customers and stakeholders.
- It is based on a number of quality management principles, including customer focus, leadership, and continuous improvement.



ISO 27001

- ISO 27001 is a quality standard that defines the requirements for an information security management system.
- It is designed to help organizations protect their information and ensure that it is secure and confidential.
- It is based on a number of information security management principles, including risk assessment, security policies, and incident response.



CMMI → J-S

- CMMI is a quality standard that defines the requirements for a mature software development process. → dev. processes
- It is designed to help organizations improve their software development processes and deliver high-quality products to their customers.
- It is based on a number of best practices for software development, including requirements management, project planning, and process monitoring.



Six Sigma

- Six Sigma is a quality standard that defines the **requirements** for a process that is capable of producing high-quality products.
- It is designed to help organizations improve their processes and reduce defects in their products and services.
- It is based on a number of quality management principles, including data-driven decision-making, process improvement, and customer focus.



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What is a System Architecture?

reference

- A **system architecture** is the structure of a system that defines its components, interactions, and relationships.
- A **system architecture** is the blueprint of a system that guides its development and implementation.
- A **system architecture** is the foundation of a system that ensures that it meets the needs of its users.



What is a System Architecture?

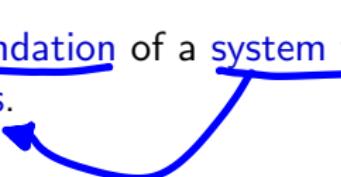
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template
structure
behavior



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*Solve
problem*



Types of System Architectures

- There are several types of system architectures that are used in systems development.
- They include monolithic, client-server, peer-to-peer, and distributed architectures.
- Each type of architecture has its own advantages and disadvantages that depend on the specific requirements of the system.



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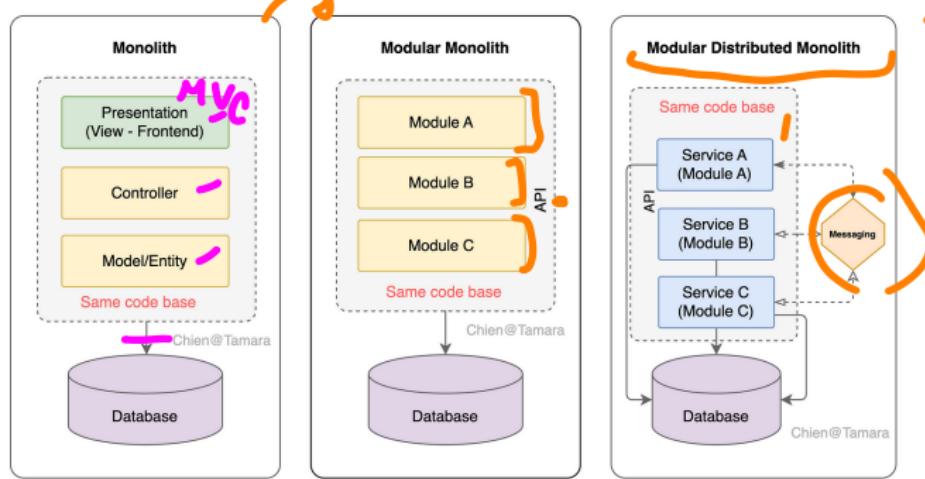


Monolithic System Architecture

oop

- A **monolithic system architecture** is a **single-tier** architecture that consists of a **single unit** that performs all the **functions** of the **system**.
- It is **simple**, **easy to develop**, and **maintain**, but it is **not scalable** and **flexible**. It is **used for small systems** that do not require high performance or reliability.

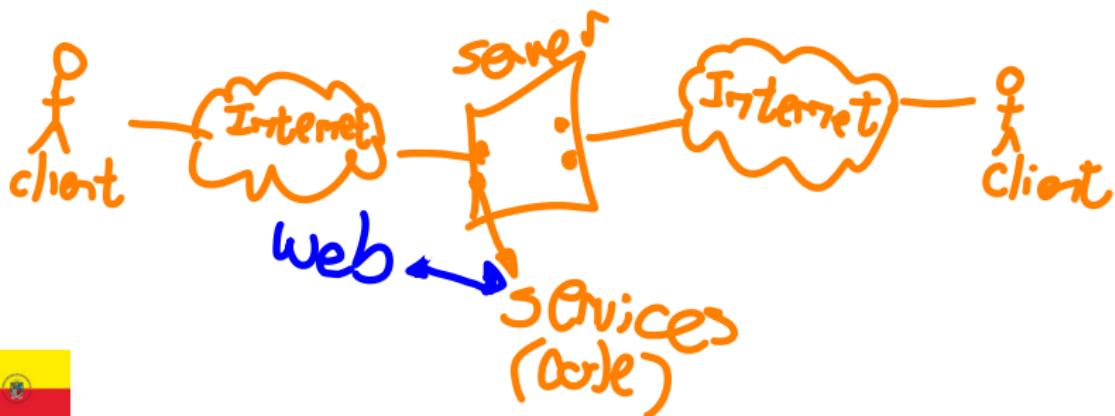
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-SRC
-qui
-data



Client-Server System Architecture

- A **client-server system architecture** is a **two-tier architecture** that consists of a client and a server that communicate with each other over a **network**.
①
②
- It is **scalable**, **flexible**, and **efficient**, but it is **complex** and **difficult** to develop and maintain. It is **used in medium to large systems** that require high performance and reliability.

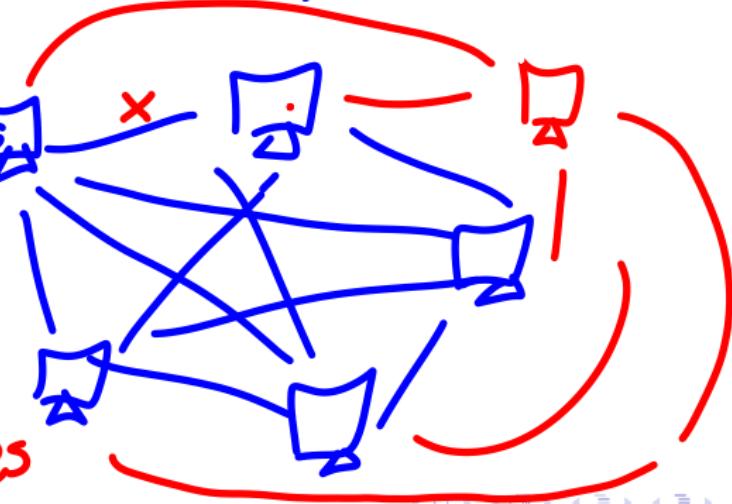
Adv. Pros.



Peer-to-Peer System Architecture

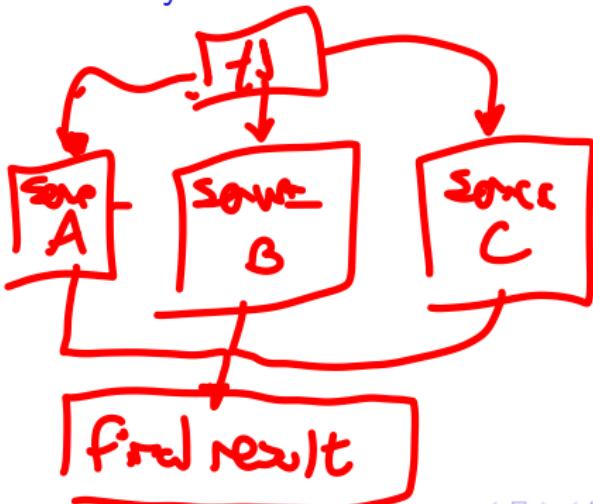
- A **peer-to-peer system architecture** is a two-tier architecture that consists of a network of peers that communicate with each other directly.
- It is scalable, flexible, and efficient, but it is complex and difficult to develop and maintain. It is used in medium to large systems that require high performance and reliability.

• Global Network
• Domotic
• Computing Cluster
Kubernetes



Distributed System Architecture

- A **distributed system architecture** is a **multi-tier** architecture that *consists of a network of nodes that communicate with each other over a network.*
- It is **scalable**, **flexible**, and **efficient**, but it is **complex** and difficult to develop and maintain. It is *used in large systems that require high performance and reliability.*



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Thanks!

Questions?



Repo: <https://github.com/EngAndres/ud-public/tree/main/courses/systems-analysis>

