

Podstawy Inżynierii Oprogramowania

Podstawowe pojęcia inżynierii oprogramowania

Inżynieria oprogramowania

Dział (poddziedzina) informatyki

- Zajmuje się wiedzą techniczną obejmującą zagadnienia wytwarzania oprogramowania
- Traktuje oprogramowania jako produkt, który ma spełniać określone potrzeby (wymagania)

IEEE (1993)

Zastosowanie systematycznego, zdyscyplinowanego, ilościowego podejścia do wykonywania, wykorzystywania i konserwowania oprogramowania

Boehm (1981)

Zastosowanie metod naukowych i matematycznych dzięki czemu możliwości sprzętu komputerowego stają się użyteczne dla ludzi dzięki programom, procedurom i odpowiedniej dokumentacji

Jaszkiewicz (1997)

Wiedza techniczna dotycząca wszystkich faz cyklu życia oprogramowania, której celem jest uzyskanie wysokiej jakości produktu - oprogramowania

Podejścia w Inżynierii Oprogramowania

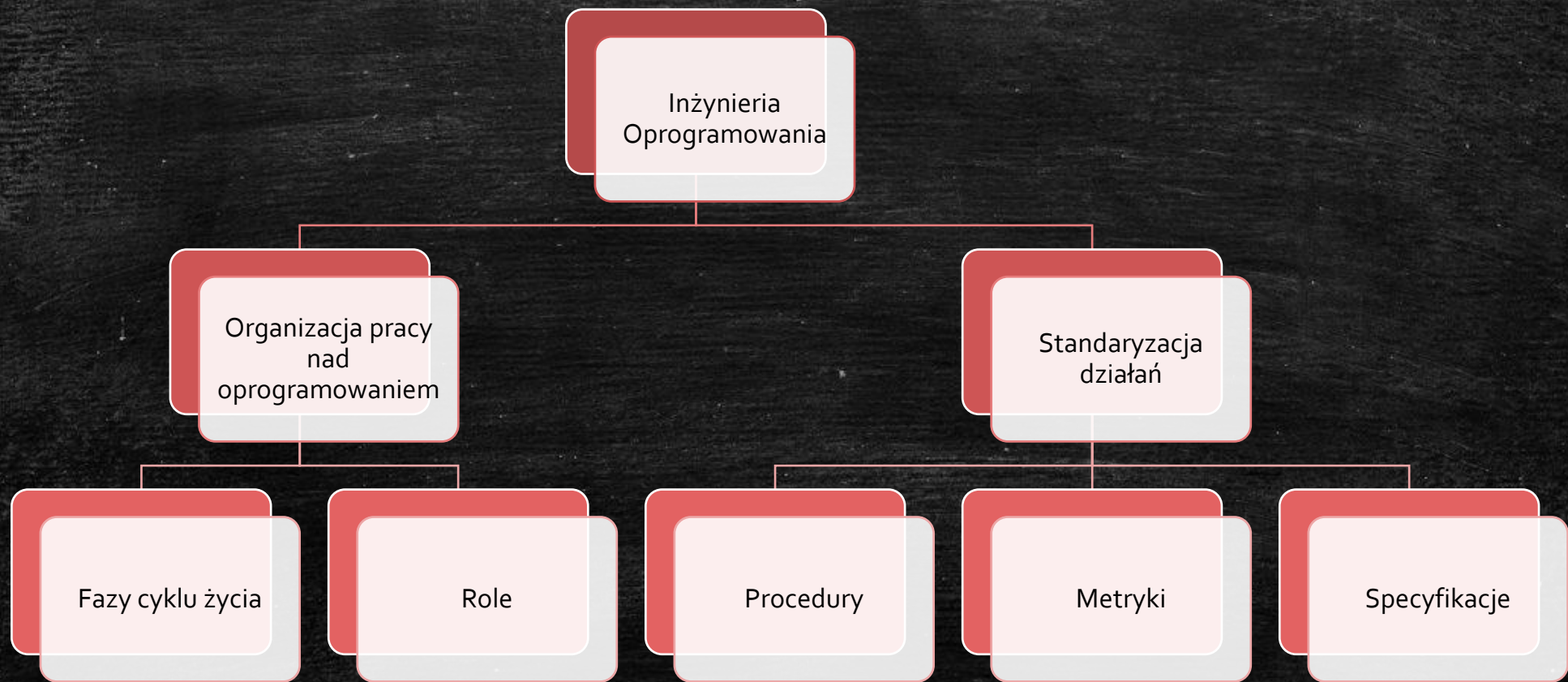
Formalne

- Podstawą jest wykorzystanie metod formalnych: języków specyfikacji, transformacji, dowodów poprawności
- Podstawowe narzędzia:
 - Indukcja matematyczna
 - Formalna transformacja specyfikacji
 - Metody uproszczone, np. logika Hoare'a

Praktyczne

- Wykorzystuje notacje nie w pełni sformalizowane, graficzne. Istotną rolę odgrywa wiedza i doświadczenie.
- Podstawowe narzędzia:
 - Good practice

Cele Inżynierii Oprogramowania



Kryzys w branży...?

Wysoki koszt oprogramowania

- Wytworzenie najprostszego rozwiązania jest bardzo kosztowne
- Koszt utrzymania oprogramowania rośnie – brak specjalistów
- Silny rozwój technologii – brak zgodności wstecznej

Niska jakość

- Każdy może być programistą, ale czy każdy potrafi nim być?
- Zwinnie nie oznacza byle jak, ale tak jest to realizowane
- Tysiąc takich samych narzędzi, ale żadne nie działa

Brak wiedzy, ale za to silna wiara

- ML czy AI?
- Dokumentacja zabija kreatywność?



Podstawowe narzędzia programisty

Abstrakcja

Przyjęcie pewnego uogólnienia, które umożliwia nam skupić się na istotnych aspektach systemu. Pomijamy w ten sposób lub eliminujemy całkowicie mniej istotne szczegóły rozważanego problemu.

Dekompozycja

Rozdzielenie problemu na podproblemy, które łatwiej zrozumieć, analizować i rozwiązywać niezależnie od siebie i niezależnie od całości. Zmniejszamy w ten sposób złożoność problemu.

Stara zasada: **DZIEL I RZĄDŹ.**

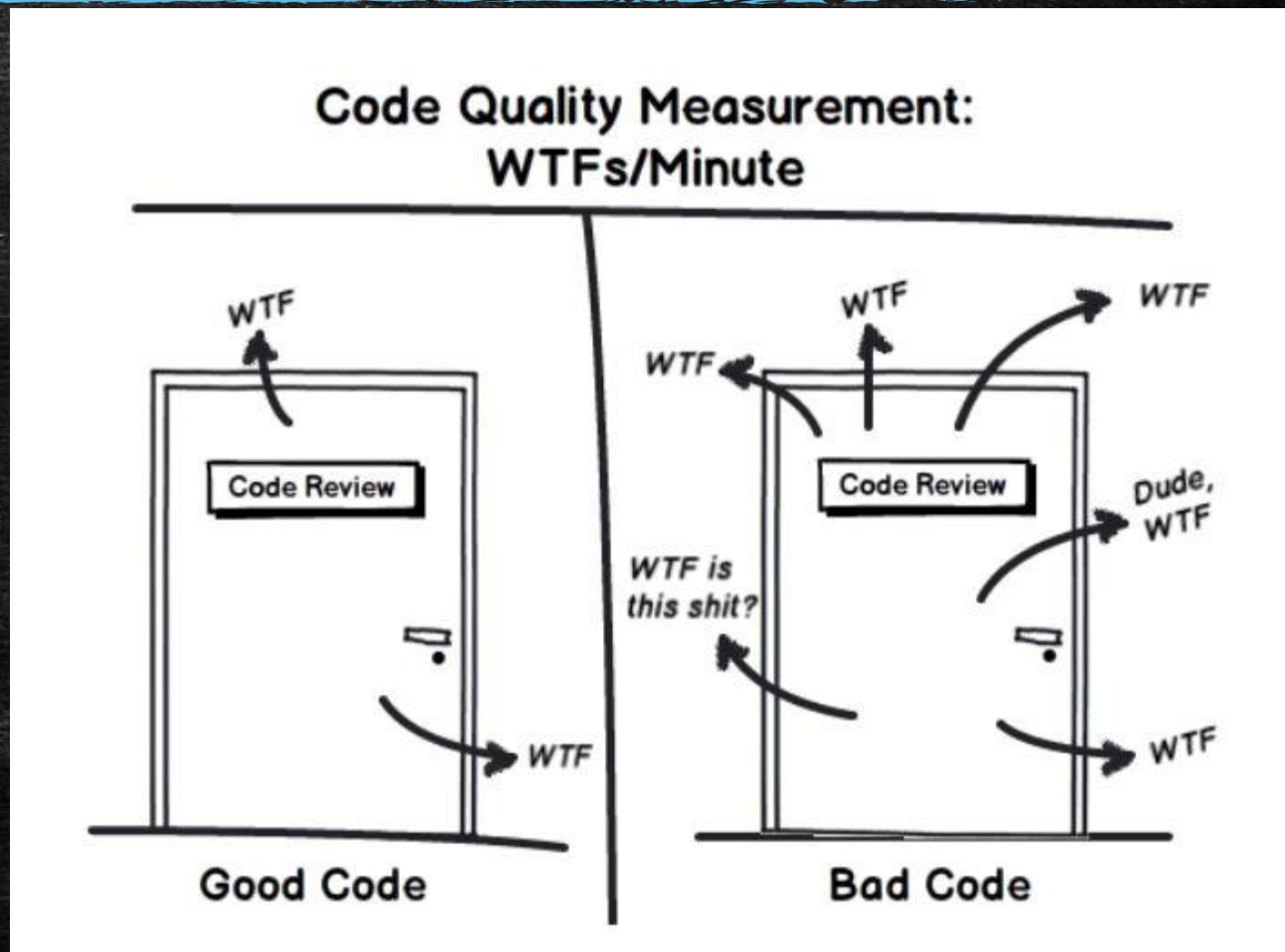
Ponowne użycie

Skoro raz coś zrobiłem, to głupotą byłoby nie użyć tego ponownie. Wykorzystanie wcześniej wytworzonych wzorców, metod, komponentów.

Zorientowanie na ludzi

Realizowane zadania powinny być użyteczne dla ludzi, a co za tym idzie dopasujemy modele pojęciowe, czy modele realizowanych systemów do wrodzonych ludzkich mechanizmów percepcji i pojmowania świata.

Podstawowe narzędzia programisty



Słownik

Podstawowe pojęcia i definicje

Abstraction

1. A view of an object that focuses on the information relevant to a particular purpose and ignores the remainder of the data.
2. The process of formulating a view as in 1.

Acceptance criteria

The criteria that a system or component must satisfy in order to be accepted by a user, customer, or other authorized entity.

Acceptance testing

1. Formal testing conducted to determine whether or not a system satisfies its acceptance criteria and to enable the customer to determine whether or not to accept the system.
2. Formal testing conducted to enable a user, customer, or other authorized entity to determine whether to accept a system or component.

Abstrakcja

1. Pewien obraz obiektu, który skupia się na informacji istotnej dla określonego celu, a ignoruje pozostałe dane
2. Proces, w którym formułujemy widok określony powyżej

Kryteria akceptacji

Kryteria, które system lub component muszą spełnić aby zostać zaakceptowane (przyjęte) przez użytkownika, klienta lub autoryzowany podmiot.

Testy akceptacyjne

1. Formalne testowanie przeprowadzane w celu określenia czy system spełnia kryteria akceptacji i umożliwia klientowi na określenie czy akceptuje system czy nie.
2. Formalne testowanie przeprowadzone w celu umożliwienia użytkownikowi, klientowi lub autoryzowanemu podmiotowi określić, czy system lub component powinien zostać zaakceptowany (przyjęty).

Podstawowe pojęcia i definicje

Acquirer

The stakeholder that acquires or procures a product or a service from a supplier.

Acquisition

The process of obtaining a system, product or service.

Activity

It is a major unit of work to be completed in achieving the objectives of a process. An activity has precise starting and ending dates, incorporates a set of tasks to be completed, consumes resources, and results in work products. An activity may have a precedence relationship with other activities.

Nabywca

Strona (Udziałowiec), który pozyskuje lub zamawia produkt lub usługę od dostawcy.

Pozyskanie

Proces, w ramach którego uzyskuje się system, produkt lub usługę.

Aktywność (działanie)

Jest to główna jednostka pracy, którą należy wykonać, aby osiągnąć cele procesu. Aktywność ma dokładne daty rozpoczęcia i zakończenia, zawiera zestaw zadań do wykonania, zużywa zasoby i daje produkty pracy. Aktywność może mieć relację zależności z innymi aktywnościami.

Podstawowe pojęcia i definicje

Agile

- 1. Response ability state marked by high competence at both proactive and reactive change.*
- 2. Project execution methods can be described on a continuum from "adaptive" to "predictive." Agile methods exist on the "adaptive" side of this continuum, which is not the same as saying that agile methods are "unplanned" or "undisciplined."*

Agreement

Mutual acknowledgment of terms and conditions under which a working relationship is conducted.

Podstawowe pojęcia i definicje

Audit

An independent examination of a work product or set of work products to assess compliance with specifications, standards, contractual agreements, or other criteria.

Architecture

- 1. fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution*
- 2. The organizational structure of a system or component; the organizational structure of a system and its implementation guidelines.*
- 3. Fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution.*

Podstawowe pojęcia i definicje

Architecture Framework

Conventions, principles and practices for the description of architectures established within a specific domain of application and/or community of stakeholders.

Baseline

1. A specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development, and that can be changed only through formal change control procedures.
2. A document or a set of such documents formally designated and fixed at a specific time during the life cycle of a configuration item.
3. Any agreement or result designated and fixed at a given time, from which changes require justification and approval.

Podstawowe pojęcia i definicje

Behaviour

- 1. Systems behavior is a change which leads to events in itself or other systems. Thus, action, reaction or response may constitute behavior in some cases.*
- 2. The effect produced when an instance of a complex system or organism is used in its operational environment.*

Black-Box System

A device, system or object which can be viewed solely in terms of its input, output and transfer characteristics without any knowledge of its internal workings, that is, its implementation is "opaque" (black).

Business Process

An inter-related set of cross-functional activities or events that result in the delivery of a specific product or service to a customer.

Podstawowe pojęcia i definicje

Bottom-up

Pertaining to an activity that starts with the lowest-level components of a hierarchy and proceeds through progressively higher levels; for example, bottom-up design; bottom-up testing.

Certification

1. A written guarantee that a system or component complies with its specified requirements and is acceptable for operational use. For example, a written authorization that a computer system is secure and is permitted to operate in a defined environment.
2. A formal demonstration that a system or component complies with its specified requirements and is acceptable for operational use.
3. The process of confirming that a system or component complies with its specified requirements and is acceptable for operational use.

Podstawowe pojęcia i definicje

Component

One of the parts that make up a system. A component may be hardware or software and may be subdivided into other components.

Configuration

1. The arrangement of a computer system or component as defined by the number, nature, and interconnections of its constituent parts.
2. In configuration management, the functional and physical characteristics of hardware or software as set forth in technical documentation or achieved in a product.

Configuration management

A discipline applying technical and administrative direction and surveillance to: identify and document the functional and physical characteristics of a configuration item, control changes to those characteristics, record and report change processing and implementation status, and verify compliance with specified requirements.

Podstawowe pojęcia i definicje

Constraint

1. A restriction, limit, or regulation imposed on a product, project, or process.
2. A type of requirement or design feature that cannot be traded off.

Cost

In the context of systems engineering, a cost is an amount expressed in a given currency related to the value of a system element, a physical interface, a physical architecture.

Customer

The organization or person that receives a product or service.

Podstawowe pojęcia i definicje

DFD (Data Flow Diagram)

A diagram that depicts data sources, data sinks, data storage, and processes performed on data as nodes, and logical flow of data as links between the nodes.

Data structure

A physical or logical relationship among data elements, designed to support specific data manipulation functions.

Design

1. A document that describes the design of a system or component. Typical contents include system or component architecture, control logic, data structures, input/output formats, interface descriptions, and algorithms.
2. (System) design includes activities to create concepts and models, and/or to conceive something (a system / a solution that answers an intended purpose) based on or using principles and concepts; the outcome of design activities is a coherent and purposeful set of models or representations using defined constructs and patterns (that implement principles and concepts).

Podstawowe pojęcia i definicje

Developer

1. Organization that performs development tasks (including requirements analysis, design, testing through acceptance) during a life cycle process.
2. Person who applies a methodology for some specific job, usually an endeavor.

E-services

A collection of network-resident software services accessible via standardized protocols, whose functionality can be automatically discovered and integrated into applications or composed to form more complex services.

Efficiency

The degree to which a system or component performs its designated functions with minimum consumption of resources.

Podstawowe pojęcia i definicje

Embedded software

Software that is part of a larger system and performs some of the requirements of that system; for example, software used in an aircraft or rapid transit system.

Enabling system

A system that complements a system-of-interest during its life cycle stages, but does not necessarily contribute directly to its function during its operation stage.

Encapsulation

A software development technique that consists of isolating a system function or a set of data and operations on those data within a module and providing precise specifications for the module.

Podstawowe pojęcia i definicje

Engineering

- 1. The application of scientific knowledge to practical problems, or the creation of useful things. The traditional fields of mechanical engineering, electrical engineering, etc. are included in this definition.*
- 2. To (cleverly) arrange for something to happen.*

Enterprise

- 1. one or more organizations sharing a definite mission, goals, and objectives to offer an output such as a product or service.*
- 2. An organization (or cross-organizational entity) supporting a defined business scope and mission that includes interdependent resources (people, organizations, and technologies) that must coordinate their functions and share information in support of a common mission (or set of related missions).*
- 3. the term enterprise can be defined in one of two ways. The first is when the entity being considered is tightly bounded and directed by a single executive function. The second is when organizational boundaries are less well defined and where there may be multiple owners in terms of the direction of the resources being employed. The common factor is that both entities exist to achieve specified outcomes.*
- 4. A complex, (adaptive) socio-technical system that comprises interdependent resources of people, processes, information, and technology that must interact with each other and their environment in support of a common mission.*

Podstawowe pojęcia i definicje

Environment

1. Anything affecting a subject system or affected by a subject system through interactions with it, or anything sharing an interpretation of interactions with a subject system.
2. The surroundings (natural or man-made) in which the system-of-interest is utilized and supported; or in which the system is being developed, produced or retired.

Evaluation

The primary purpose of software evaluation is to provide quantitative results concerning the qualities of a software product that are comprehensible, acceptable, and trustable by any interested party. Therefore the evaluation procedure proposed complies with requirements stated in international standards

Podstawowe pojęcia i definicje

Failure

The inability of a system or component to perform its required functions within specified performance requirements.

Feasibility study

Analysis of the known or anticipated need for a product, system, or component to assess the degree to which the requirements, designs, or plans can be implemented.

Firmware

The combination of a hardware device; e.g., an IC; and computer instructions and data that reside as read only software on that device. Such software cannot be modified by the computer during processing.

Podstawowe pojęcia i definicje

Framework

Architectural Framework: Conventions, principles and practices for the description of architectures established within a specific domain of application and/or community of stakeholders.

Function

1. A system outcomes which contribute to goals or objectives. To have a function, a system must be able to provide the outcome through two or more different combinations of elemental behavior.
2. An action, a task, or an activity performed to achieve a desired outcome.
3. A function is defined by the transformation of input flows to output flows, with defined performance.
4. A broad work area encompassing multiple related disciplines (e.g., Engineering, Finance, Human Resources, etc.).

Podstawowe pojęcia i definicje

Implementation

1. The process of translating a design into hardware components, software components, or both.
2. The phase in the software life-cycle where the actual software is implemented. The result of this phase consists of source code, together with documentation to make the code more readable.

Implementation Model

The implementation model consists of the code files and the used work structure. It includes the application software description as well as the support software description. While the design model is a more abstract view, the implementation model contains the full information necessary to build the system.

Implementer (developer)

organization that performs implementation tasks.

Podstawowe pojęcia i definicje

Inspection

A static analysis technique that relies on visual examination of development products to detect errors, violations of development standards, and other problems. Types include code inspection; design inspection.

installation and checkout phase

The period of time in the software life cycle during which a software product is integrated into its operational environment and tested in this environment to ensure that it performs as required.

Integration

A process that combines system elements to form complete or partial system configurations in order to create a product specified in the system requirements.

Podstawowe pojęcia i definicje

Leader

A leader is one or more people who selects, equips, trains, and influences one or more follower(s) who have diverse gifts, abilities, and skills and focuses the follower(s) to the organization's mission and objectives causing the follower(s) to willingly and enthusiastically expend spiritual, emotional, and physical energy in a concerted coordinated effort to achieve the organizational mission and objectives.

Lean Systems Engineering (LSE)

- 1. The application of lean principles, practices, and tools to SE to enhance the delivery of value to the system's stakeholders.*
- 2. Lean Systems Engineering (LSE) is the area of synergy between lean thinking and SE, with the goal to deliver the best life-cycle value for technically complex systems with minimal waste; under the lean SE philosophy, mission assurance is non-negotiable, and any task that is legitimately required for success must be included, but it should be well-planned and executed with minimal waste.*

Podstawowe pojęcia i definicje

Life Cycle

- 1. The organized collection of activities, relationships and contracts which apply to a system-of-interest during its life.*
- 2. The evolution of a system, product, service, project or other human-made entity from conception through retirement.*
- 3. Development (life) cycles start with user needs and end with system decommissioning and disposal. Project cycles contain three aspects: business, budget, and technical.*

Life Cycle Management

The end-to-end management of the life cycle.

Life Cycle Model

A framework of processes and activities concerned with the life cycle that may be organized into stages, which also acts as a common reference for communication and understanding

Podstawowe pojęcia i definicje

Logical Architecture

The logical architecture of a system is composed of a set of related technical concepts and principles that support the logical operation of the system. It includes a functional architecture, a behavioral architecture, and a temporal architecture.

Maintainer

individual or organization that performs maintenance activities.

Maintenance

The process of modifying a system or component after delivery to correct faults, improve performance or other attributes, or adapt to a changed environment.

Podstawowe pojęcia i definicje

maintenance plan

a document setting out the specific maintenance practices, resources, and sequence of activities relevant to maintaining a software product

manage project team

the process of tracking team member performance, providing feedback, resolving issues, and managing changes to optimize project performance

manage stakeholder expectations

the process of communicating and working with stakeholders to meet their needs and addressing issues as they occur

management

system of controls and processes required to achieve the strategic objectives set by the organization's governing body

Podstawowe pojęcia i definicje

mean execution time

the mean value of all execution times of tasks of the j -the task type which were submitted within the rating interval

mean time between failures (MTBF)

the expected or observed time between consecutive failures in a system or component

mean time to repair (MTTR)

1. expected or observed duration required to return a malfunctioning system or component to normal operations
2. the mean time the maintenance team requires to implement a change and restore the system to working order

Podstawowe pojęcia i definicje

measure

variable to which a value is assigned as the result of measurement

measure of effectiveness (MOE)

the metrics by which an acquirer will measure satisfaction with products produced by the technical effort

measure of performance (MOP)

an engineering performance measure that provides design requirements that are necessary to satisfy an MOE

There are several measures of performance for each MOE

Podstawowe pojęcia i definicje

menu

a list displayed on a screen showing available functions from which a choice can be made

message

a communication sent from one object to another

metalanguage

a language used to specify some or all aspects of a language

metamodel

1. a logical information model that specifies the modeling elements used within another (or the same) modeling notation
2. a model containing detailed definitions of the meta-entities, meta-relationships and meta-attributes whose instances appear in the model section
3. specification of the concepts, relationships and rules that are used to define a methodology

Podstawowe pojęcia i definicje

method

an implementation of an operation

methodology

a system of practices, techniques, procedures, and rules used by those who work in a discipline

metric

the defined measurement method and the measurement scale

milestone

- 1.a significant point or event in the project
- 2.a scheduled event used to measure progress

mistake

a human action that produces an incorrect result

The fault tolerance discipline distinguishes between a human action (a mistake), its manifestation (a hardware or software fault), the result of the fault (a failure), and the amount by which the result is incorrect (the error).

Podstawowe pojęcia i definicje

model

- 1.a representation of a real-world process, device, or concept
- 2.a representation of something that suppresses certain aspects of the modeled subject
- 3.a semantically closed abstraction of a system or a complete description of a system from a particular perspective

model glossary

the collection of the names and definitions of all defined concepts that appear within the views of a model

module

- 1.a program unit that is discrete and identifiable with respect to compiling, combining with other units, and loading
- 2.a logically separable part of a program

Podstawowe pojęcia i definicje

monitoring and controlling processes

those processes required to track, review, and regulate the progress and performance of the project, identify any areas in which changes to the plan are required, and initiate the corresponding changes.

multiple inheritance

the ability of a subclass to inherit responsibilities from more than one superclass.

multiplicity

a natural number (i.e., non-negative integer) which describes the number of repetitions of an item in a multiset.

N-ary relationship

a relationship with arity (degree) $n > 2$

Podstawowe pojęcia i definicje

natural language

a language whose rules are based on usage rather than being pre-established prior to the language's use

navigation

means by which a user moves from one part of a software application to another.

nesting

embedding one construct inside another

nonfunctional requirement

a software requirement that describes not what the software will do but how the software will do it.

Podstawowe pojęcia i definicje

nonidentifying relationship

a specific (not many-to-many) relationship in which some or all of the attributes contained in the primary key of the parent entity do not participate in the primary key of the child entity

nonprocedural language

a language in which the user states what is to be achieved without having to state specific instructions that the computer must execute in a given sequence

nontechnical requirement

requirement affecting product and service acquisition or development that is not a property of the product or service

normalization

the process by which any data structure can be transformed by a database designer into a set of normalized relations that have no repeating groups

Podstawowe pojęcia i definicje

notation standard

a standard that describes the characteristics of formal interfaces within a profession

object

1. an encapsulation of data and services that manipulate that data
2. a specific entity that exists in a program at runtime in object-oriented programming
3. a member of an object set and an instance of an object type

Object Management Group (OMG)

an international standards organization that owns and maintains CORBA and UML standards

object model

an integrated abstraction that treats all activities as performed by collaborating objects and encompassing both the data and the operations that can be performed against that data

Podstawowe pojęcia i definicje

object-oriented design

a software development technique in which a system or component is expressed in terms of objects and connections between those objects

object-oriented language

a programming language that allows the user to express a program in terms of objects and messages between those objects

OCL

Object Constraint Language

off-the-shelf

already developed and available

Podstawowe pojęcia i definicje

one-to-many relationship

a relationship between two state classes in which each instance of one class, referred to as the child class, is specifically constrained to relate to no more than one instance of a second class, referred to as the parent class.

ontology

a logical structure of the terms used to describe a domain of knowledge, including both the definitions of the applicable terms and their relationships

organization

person or a group of people and facilities with an arrangement of responsibilities, authorities and relationships

organizational breakdown structure (OBS)

a hierarchically organized depiction of the project organization arranged so as to relate the work packages to the performing organizational units.

Podstawowe pojęcia i definicje

organizational maturity

extent to which an organization has explicitly and consistently deployed processes that are documented, managed, measured, controlled, and continually improved

overhead time

the amount of time a computer system spends performing tasks that do not contribute directly to the progress of any user task

package

a separately compilable software component consisting of related data types, data objects, and subprograms

parent entity

an entity in a specific relationship whose instances can be related to a number of instances of another entity (child entity)

Podstawowe pojęcia i definicje
