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software engineering dependability

Software Quality Assurance
Terminology

Contents

- System, technical system
- Quality, quality requirement, quality characteristic, quality measure
- Safety, technical safety
- Correctness
- Robustness
- Reliability, availability
- Failure, fault

Definition of Terms

- System
  - Technical and organizational means for the autonomous fulfillment of a task (based on Birolini, ETH)
  - Generally, a system can consist of hardware, software, people (service and maintenance personnel) and logistic assistance

- Technical System
  - System where influences by people and logistics are ignored

Definition of Terms

- Quality
  - Degree in which the inherent attributes of an entity fulfill quality requirements /DIN EN ISO 9000 05/
- Quality Requirement
  - Expectation or demand defined (by a customer) that is generally assumed or mandatory /DIN EN ISO 9000 05/
- Quality Characteristic
  - Property of an entity on the basis of which its quality is described and estimated, but which makes no statement about the degree of fulfillment of the characteristic
  - A quality characteristic can be refined incrementally into partial characteristics
  - Inherent attribute of a process, product or a system that relates to a quality requirement /DIN EN ISO 9000 05/.
- Quality Measure
  - Measure which allows to draw conclusions on the fulfillment of specific quality characteristics. For instance, MTTF (Mean Time To Failure) is a quality measure of the quality characteristic Reliability.

Definition of Terms

- Safety
  - Absence of unacceptable risks /IEC 61508 98/
  - State where the danger of a personal or property damage is reduced to an acceptable value (DIN EN ISO 8402)
  - Birolini defines safety as a measure for the ability of an item to endanger neither persons, property nor the environment
  - A distinction is drawn between the safety of a failure-free system (accident prevention) and the technical safety of the failure afflicted system

- Technical Safety
  - Measure for the ability of a failure afflicted item to endanger neither persons, property nor the environment

Definition of Terms

- Correctness
  - Correctness has a binary character, i.e., an item is either correct or incorrect
  - A fault-free realization is correct
  - An artifact is correct if it is consistent to its specification
  - If no specification exists for an artifact, correctness is not defined

Definition of Terms

- Robustness
  - Property to deliver an acceptable behavior also in exceptional situations (e.g. ability of a software to detect hardware failures)
  - A correct system – as measured by the specification – can have a low robustness, actually
  - Accordingly, robustness is rather a property of the specification than of the implementation
  - A robust program is the result of the correct implementation of a good and complete specification
  - Robustness has a gradual character

Definition of Terms

- Reliability
  - Part of the quality with regard to the behavior of an entity during or after given time periods with given working conditions (DIN 40041)
  - Collective term for the description of the power concerning availability and its influencing factors: power concerning functionality, maintainability and maintainability support (DIN EN ISO 8402)
  - Property of an entity regarding its qualification to fulfill the reliability requirements during or after given time periods with given application requirements (DIN ISO 9000)
  - Measure for the ability of an item to remain functional, expressed by the probability that the required function is executed failure-free under given working conditions during a given time period (based on Birolini, ETH)

- Availability
  - Measure for the ability of an item to be functional at a given time

Definition of Terms

- Failure, Fault
  - Failure: Inconsistent behavior w.r.t. specified behavior while running a system (happens dynamically during the execution) ➔ Each failure has a time-stamp
  - Fault, defect: Statically existent cause of a failure, (i.e., a „bug“). Usually the consequence of an error made by the programmer

References

/Birolini 97/: Birolini A., *Zuverlässigkeit von Geräten und Systemen*, Berlin, Heidelberg, New York: Springer, 1997

/DIN 55350-11 95/: DIN 55350-11, Begriffe zu Qualitätsmanagement und Statistik - Teil 11: Begriffe des Qualitätsmanagements, Berlin: Beuth Verlag, August 1995

/DIN EN ISO 8402 95/: DIN EN ISO 8402, Qualitätsmanagement - Begriffe (ISO 8402: 1994); Dreisprachige Fassung EN ISO 8402: 1995, Berlin: Beuth Verlag, August 1995

/DIN ISO 9000 05/: DIN EN ISO 9000, Qualitätsmanagementsysteme – Grundlagen und Begriffe, Berlin: Beuth Verlag, Juni 2005

/DIN 40041 90/: DIN 40041, Zuverlässigkeit; Begriffe, Berlin: Beuth Verlag, Dezember 1990

/IEC 61508 98/: IEC 61508: Functional Safety of Electrical / Electronic / Programmable Electronic Safety-related Systems, Part 1-7, IEC, 1998