What is an Ontological Fault and why does it exist ?

Algirdas Avizienis
Distinguished Professor Emeritus, UCLA and
Rector Emeritus, Vytautas Magnus University, Lithuania

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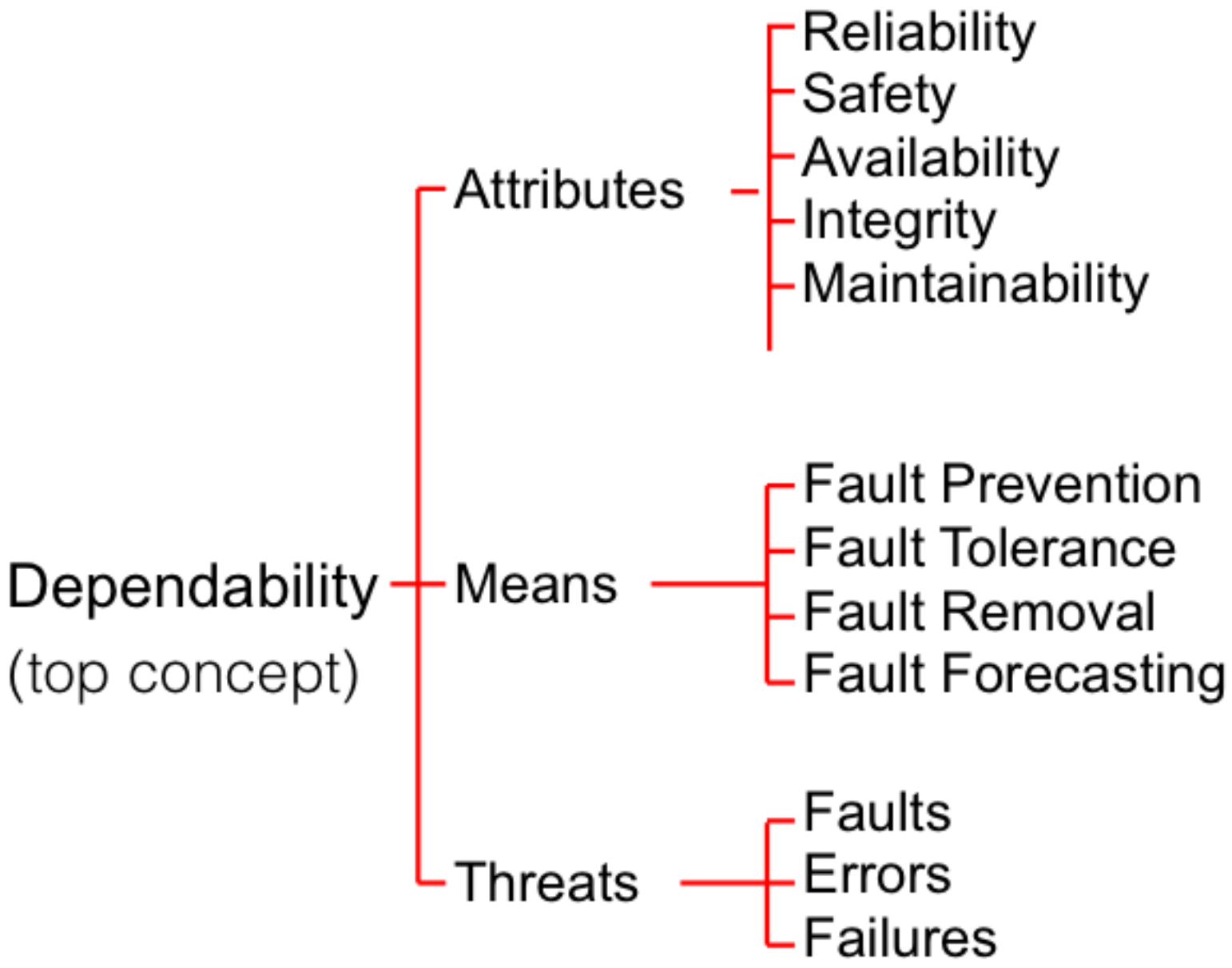
The Quantitative Definition of Dependability

The ***dependability*** (of a system)
is the ability to avoid service failures that are
(1) more frequent, and
(2) more severe
than is acceptable (to the user)

The Qualitative Definition of Dependability

The ***dependability*** (of a system)
is the ability deliver service
that can justifiably be trusted
(by the user)

The Dependability Taxonomy



A Crowded Field = A Real Mess

A ***dependable system*** delivers *expected service* (described by the *Attributes*) under *adverse circumstances* (described by the *Threats*) by using the *Means* to attain ***dependability.***

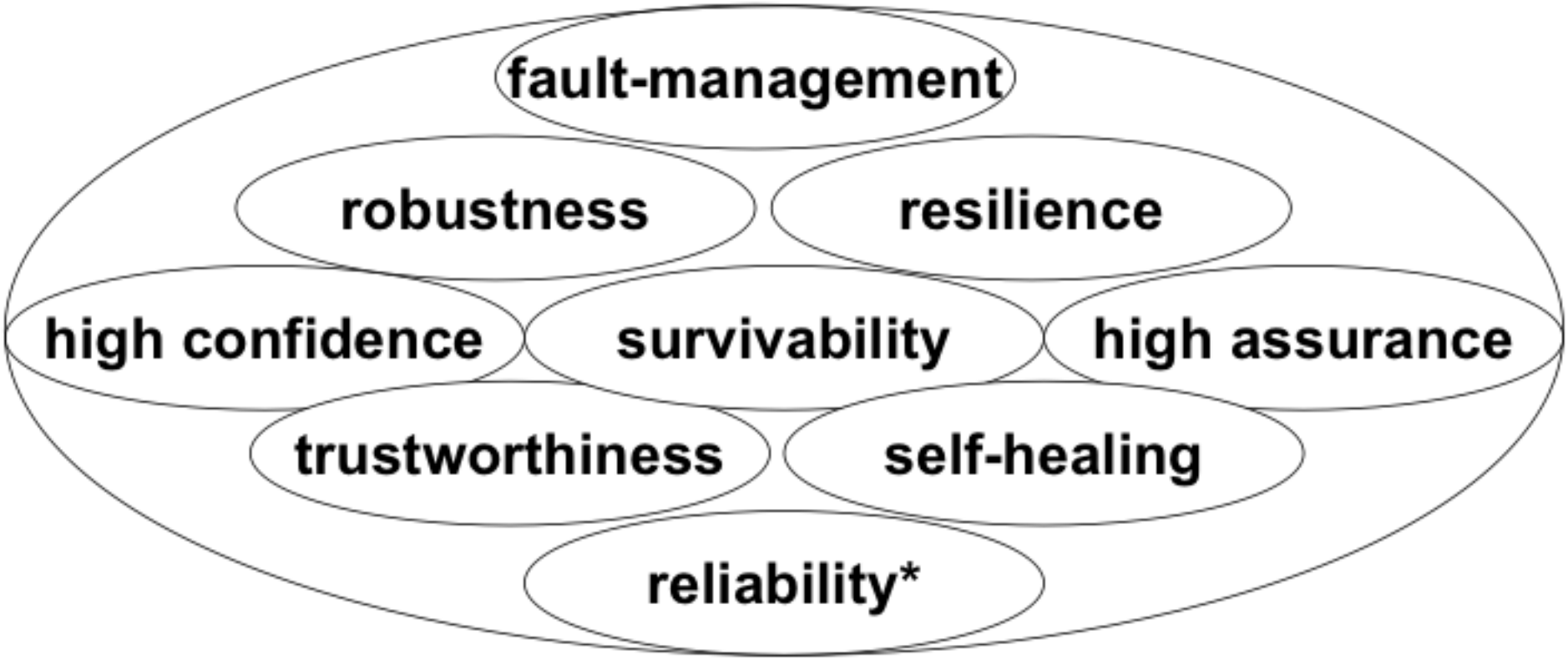
However, these systems are intended to do the same:
survivable, trustworthy, robust, high-confidence, reliable, high-assurance, self-healing, fault-managed, resilient

Are these ***top concepts*** equivalent or do they differ from dependability and/or among themselves ?

That is - ***how are they related ?*** We look for the answer by comparing their *taxonomies*.

Our Field's Objective: deliver expected service under adverse circumstances

Our Field's other Top Concepts:



****used as a top concept, not as an attribute of dependability***

Resilience as defined by J.-C. Laprie

in “From Dependability to Resilience”, Proc. DSN 2008, supplemental volume, Anchorage, AL, June 2008.

***Resilience* is the persistence of *dependability* when facing changes.”**

There are *3 dimensions of changes:*

1. their ***nature***: *functional, environmental, technological* (hardware and software)

2. their ***prospect:*** *foreseen* (new software versions), *foreseeable* (new hardware), *unforeseen* (new types of threats, new fault classes, etc.)

3. their ***timing***: *short term* (seconds to hours), *medium term* (hours to months, as in new versioning or reconfigurations), *long term* (months to years, as in merger of airline or banking information systems, or in military coalitions)

One More Threat: Ontological Fault

Each of these ***top concepts*** has appeared in the title of at least one international conference and in the titles and texts of numerous publications.

The absence of defined relationships between those top concepts is a major threat to the progress of our field - we call it an ***ontological fault.***

An ***ontology*** *is* a structured representation of the relationships between the concepts of a field. It may be seen as a taxonomy with more than one relationship, for example: inclusion plus causation.

An ***ontological fault*** exists when the relationship of one top concept of a field to the others is not identified in a field that has two or more top concepts.

To search for taxonomy information about the *Top Concepts* shown below (and dependability) we have reviewed the

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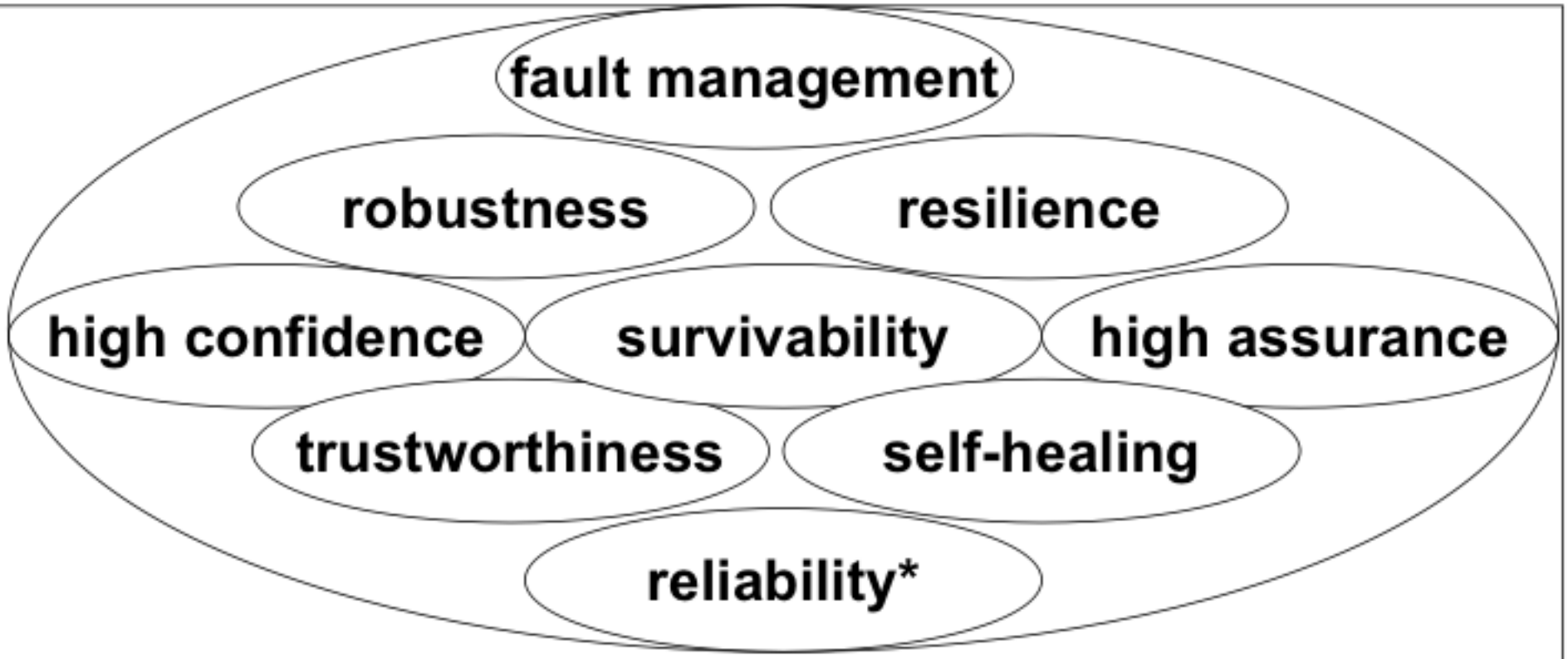
ACM Computing Classification System, 2012 Revision

(abbreviated *ACM CCS* in the following slides)



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ACM CCS: **(1)*General and reference***

(2) Cross-computing tools and techniques

(3) Reliability

Empirical studies

Measurement

Metrics

Evaluation

Experimentation

Estimation

Design

Performance

Validation

Verification

ACM CCS: **(1)*Hardware***

(2) Robustness

(3) Fault tolerance

(4) Error detection and error correction

Failure prediction

Failure recovery, maintenance and self-repair

Redundancy

Self-checking mechanisms

System-level fault tolerance

ACM CCS: **(1)** ***Hardware*** (continued)

(3) Hardware reliability

(4) Aging of circuits and systems

Circuit hardening

Transient errors and upsets

Early-life failures and infant mortality

Process, voltage and temperature variations

Signal integrity and noise analysis

(3) Safety critical systems

ACM CCS**: (1)*Computer systems organization***

(2) Dependable and fault-tolerant systems and networks

(3) Reliability

Availability

Maintainability and maintenance

Processors and memory architectures

Secondary storage organization

Redundancy

Fault-tolerant network topologies

ACM CCS:**(1)*Software and its engineering***

(2) Extra-functional properties

(3) Interoperability

Software performance

Software reliability

Software fault tolerance

(4) Checkpoint / restart

Software safety

Software usability

ACM CCS:**(1)** ***Networks***

(2) Network reliability

(3) Error detection and error correction

Conclusions about ACM CCS 2012:

1.The representation of our Field is very confused.

2.The concepts *Dependability, Resilience* are missing.

3.Only *Robustness and Reliability can be found of the ten *Top Concepts.***

4. Reliability* is not provided with any taxonomy

5. Robustness is a "catch-all" concept

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Why ???

» To draw attention to a major problrm