WADS 2003 Panel: Fault Tolerance and Self-Healing

Moderator:

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Panellists:

- *Valerie Issarny (INRIA, France)*
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Motivation

- What makes *self-healing* different from *fault tolerance*:
  - avoid the tenet that it is a more appealing term;
- Fault tolerance - a means to dependability:
  - delivery of specified service, despite the presence of faults;
- Self-healing – being used by the software engineering community;
  - there is no consensus based definition;

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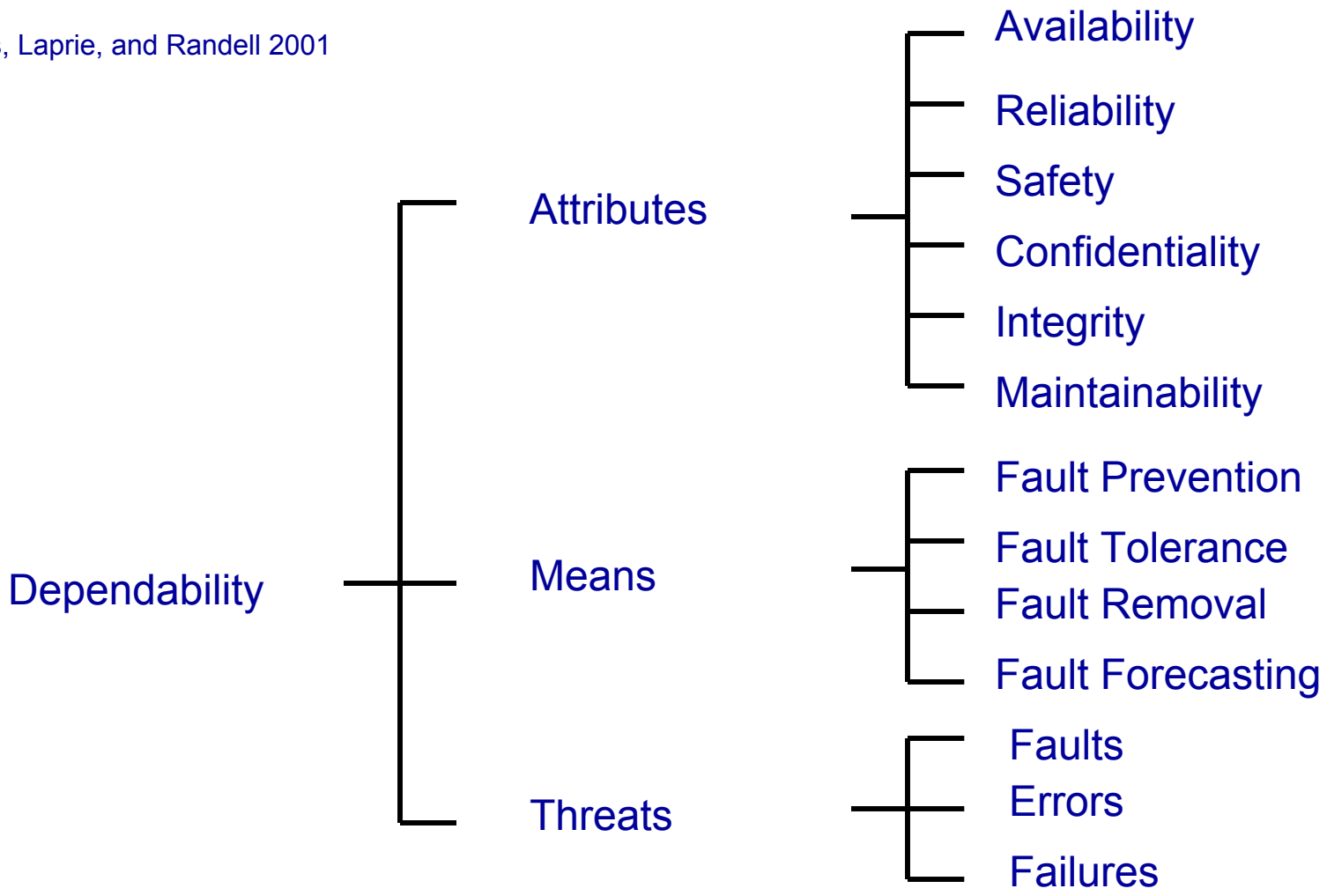
Dependability Tree

Avizienis, Laprie, and Randell 2001



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Motivation

Software engineering:

- development of software systems based on rigorous (sometimes formal) languages and processes, supported by tools;
  - fault prevention:
    - e.g., goal structures, and UML;
  - fault removal (V&V):
    - e.g., model checking, and testing;
- build software systems without bugs;

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Motivation

Software engineering and self-healing:

- build software systems that may have bugs;
  - e.g., components interface types do not match;
  - nature e.g., healing of a wound;

- build software systems that adapt to changes in the environment;
  - e.g., adjust performance depending on resources;
  - nature e.g., sweating regulates body temperature;
  - the notion of “healing” is not evident;
    - reacting to changes by adapting;

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Opportunities (or not)

Dependability versus Software Engineering

- Dependability perspective:
  - *Self-healing is re-inventing the wheel* – all problems and solutions being investigated have already been mapped out;
- Software engineering perspective:
  - *Fault tolerance provides expensive solutions* – redundancies are expensive, leading to complex systems:
    - although solutions elegant, they are impractical;
- Is there a middle way between these two perspectives;

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Challenges

- Is the software engineering community moving from design time into run time solutions?
  - the same type of problems that the hardware community faced decades ago?
- Are software engineering and dependability communities dealing with the same type of problems?
- Is the dependability “framework” too strict, or inappropriate, to self-healing?
  - why this?
  - what can and should be re-used?

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Challenges

- At what stages of software development should “self-healing” be employed?
  - fault tolerance has been effective at the later design stages;
  - at the software architectural level?
    - redundancies at the high level lead to waste of resources;
- If there are no system faults, what would be the framework that would allow the system to react to changes?
  - what are the undesirable, though not unexpected circumstances?
  - how these should be handled?

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Challenges

Last but not least:

- If *fault tolerance* and *self-healing* deal with the same type of problems would it be wise to adopt the self-healing since is a more appealing then the ‘old’ boring fault tolerance?
  - it is a more intuitive term, at least;

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Dependability Conferences

Conferences sponsored by IFIP WG10.4 and/or IEEE TC FTC:

- International Conference on Dependable Systems and Networks (DSN);
- IEEE Symposium on Reliable Distributed Systems (SRDS);
- International Symposium on Software Reliability Engineering (ISSRE);
- International Conference of Computer Safety, Reliability and Security (SAFECOMP);
- Regional conferences:
  - European Dependable Computing Conference (EDCC);
  - Pacific Rim Int. Symposium on Dependable Computing (PRDC);
  - Latin American Symposium on Dependable Computing (LADC);