Survivable Systems & Networks

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Introduction

- General rules of this course…
  - Your responsibilities
  - Including other people’s materials
  - Plagiarism
Introduction

- What are Survivable Systems and Networks?
- What are the characteristics?
- Where do we need Survivable Systems and Networks?

Introduction

- What is Fault-tolerance?
- Let’s consider the paper
  - This is not a comprehensive review of all the topics, but a good “primer”
  - It is your responsibility to read the paper! We will have a brief discussion about it in class.
  
  - Later we will also look at the paper
    - Basic Concepts and Taxonomy of Dependable and Secure Computing, Algirdas Avizienis, Jean-Claude Laprie, Brian Randell, and Carl Landwehr, IEEE TRANSACTIONS ON DEPENDABLE AND SECURE COMPUTING, VOL. 1, NO. 1, JANUARY-MARCH 2004
Introduction

- Faults, Errors and Failures
  - What is the difference?
  - Examples of faults,
    - Stuck-at, bridging fault
  - Fault properties
    - Transient, intermittent, permanent
  - Fault models
    - Benign, symmetric, asymmetric, …
  - Fault assumptions
    - Common mode vs. independence of faults

Introduction

- Evaluating dependability and fault tolerance
  - What is dependability anyway?
  - Reliability
  - Unreliability
  - Availability
  - Maintainability
  - “illities”
Introduction

- MTTF and MTBF
  - Mean Time to between Failure

- Bathtub curve
  - What is it and why do we care about it?
  - Is it relevant to malicious act?

Introduction

- Fault-tolerance Strategies
  - Masking
  - Detection
  - Containment
  - Diagnosis
  - Repair/Reconfiguration
  - Recovery
Introduction

- Redundancy
  - Spatial Redundancy
  - Information Redundancy
  - Time Redundancy

Figure 1. Replicated lockstep operation of modules with redundant outputs checked in each clock cycle: (a) logic compared externally; (b) logic compared on chip.
Figure 2. Continuous operation with duplex self-checking modules: (a) two self-checked modules; (b) four simple modules as two self-checked pairs.

Figure 3. Triplicated voters and modules forming one triple modular-redundant stage of a system, with voting at module inputs.