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?

TERMS AND DEFINITIONS

- Survivable Systems
- Intrusion Tolerant Systems
- Resilient Systems
- Fault-tolerant Systems
- These terms are not identical, but they have so much in common. In this class we will cover topics from all and you will see that often you may not be sure anymore which term the articles you read relates to the most.

What is Fault-tolerance?

Let's consider the paper

- Fault-Tolerant Computing: Fundamental Concepts, by Victor P. Nelson
- This is not a comprehensive review of all the topics, but a good quick "primer"
- It is your responsibility to read the paper! We will have only a brief discussion about it in class.

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

- Evaluating dependability and fault tolerance
  - What is dependability anyway?
  - Reliability
  - Unreliability
  - Availability
  - Maintainability
  - "illities"

- 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?
  - How does it relate to R(t)?
  - What are the statistical and practical assumptions?

- Fault-tolerance Strategies
  - Masking
  - Detection
  - Containment
  - Diagnosis
  - Repair/Reconfiguration
  - Recovery
  - Descriptions are in the paper

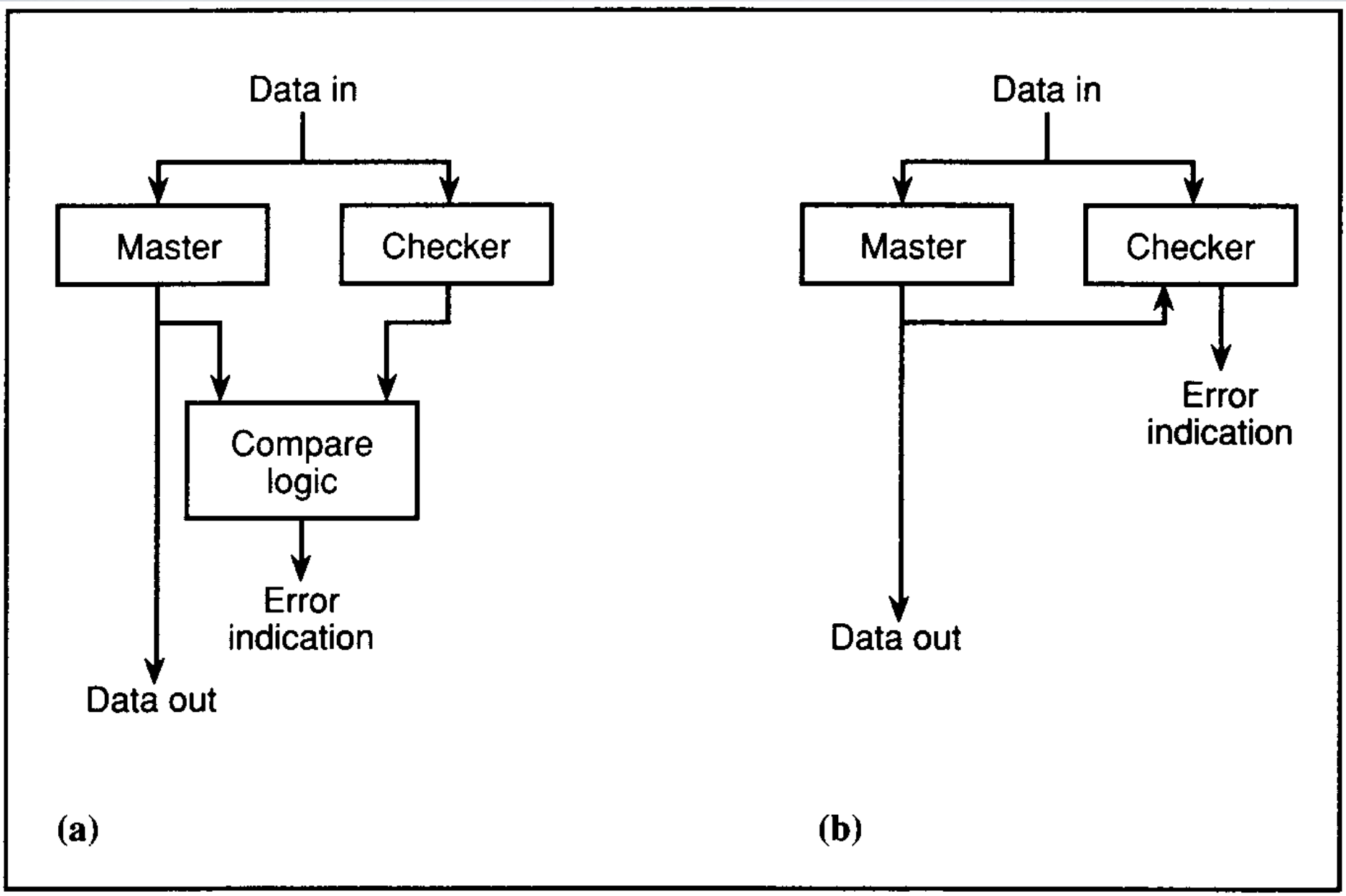

Figure 1. Replicated lockstep operation of modules with redundant outputs checked in each clock cycle: (a) logic compared externally; (b) logic compared on chip.

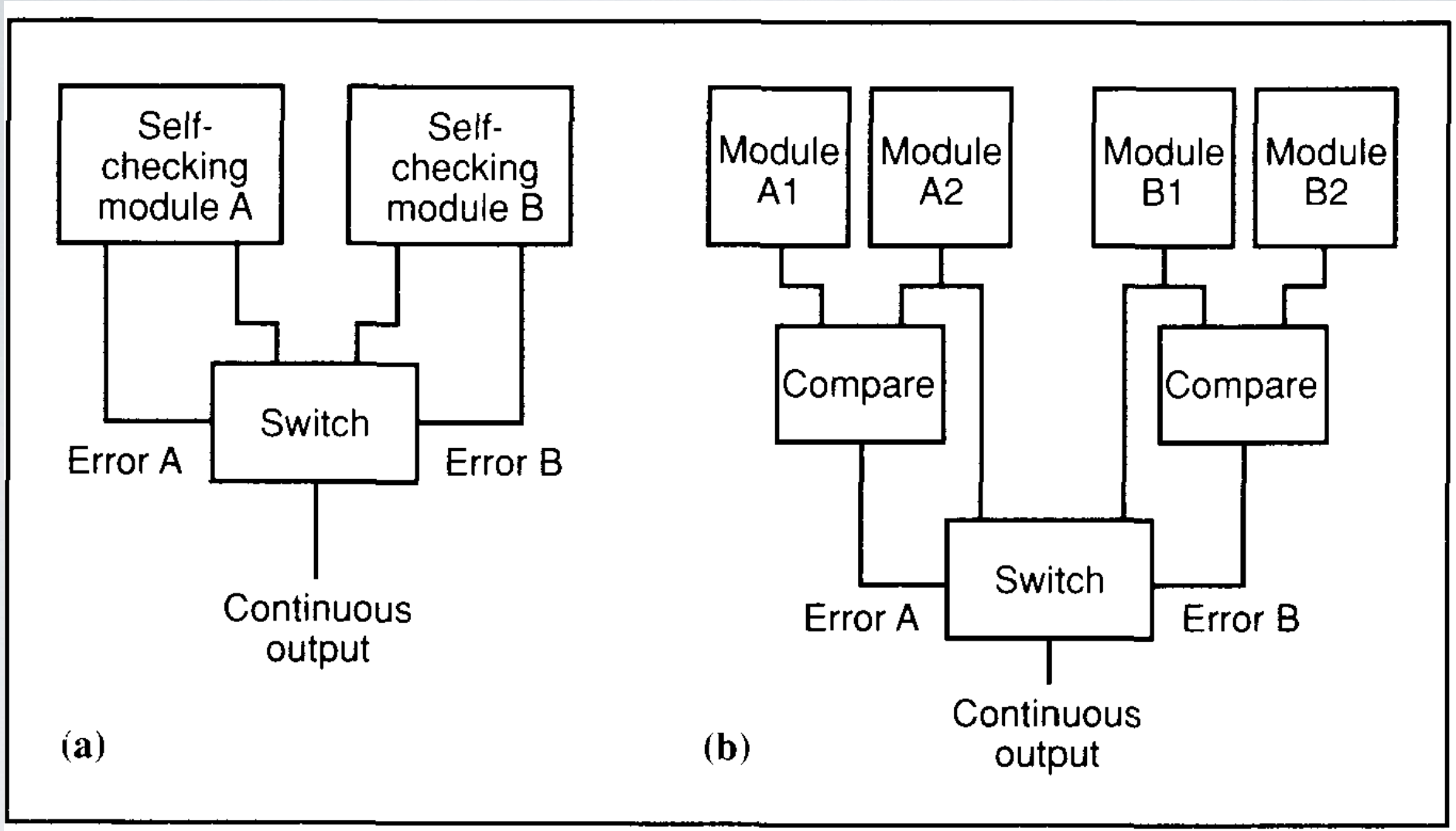

Figure 2. Continuous operation with duplex self-checking modules: (a) two self-checked modules; (b) four simple modules as two self-checked pairs.

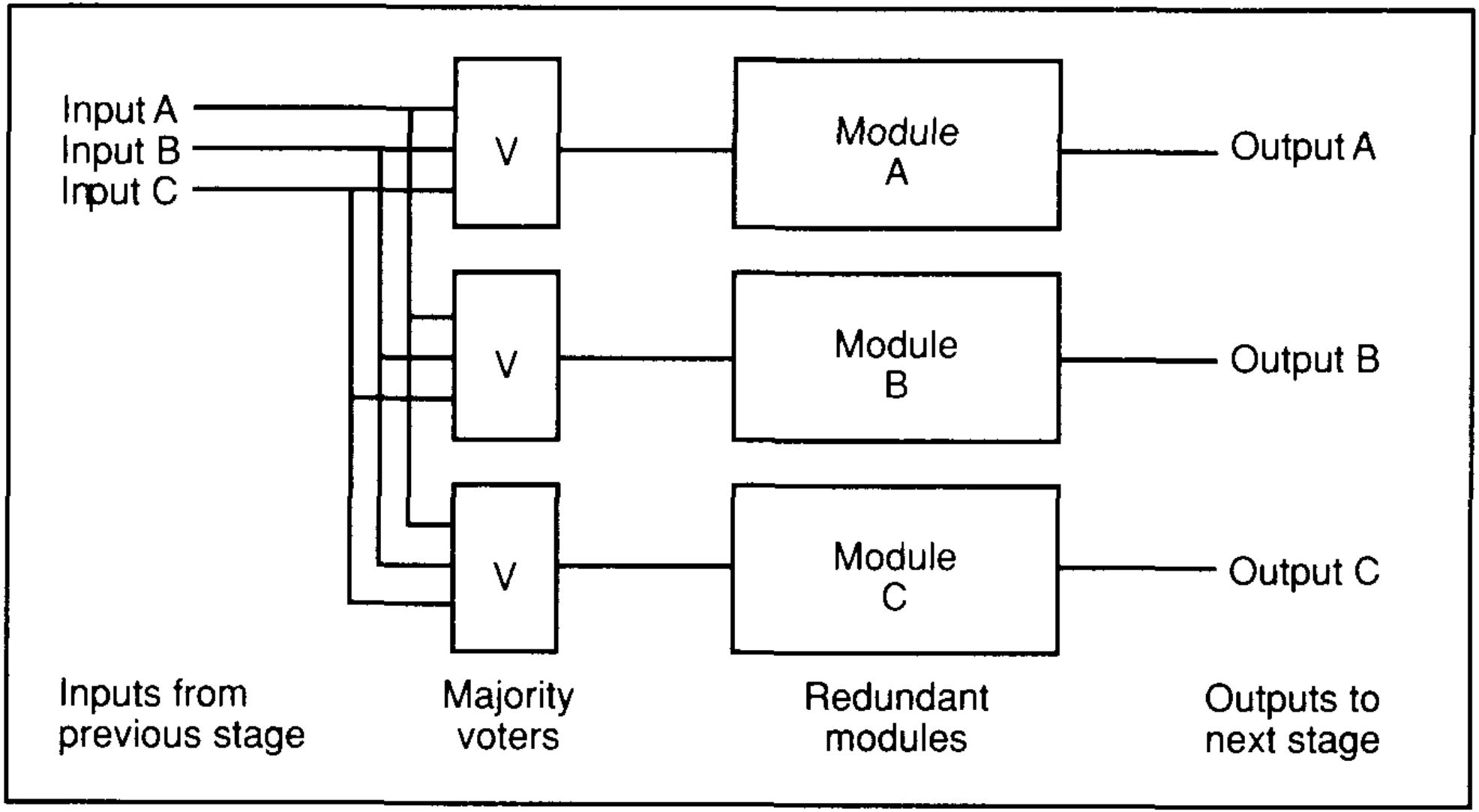

Figure 3. Triplicated voters and modules forming one triple modular-redundant stage of a system, with voting at module inputs.