Paper “Reliability Issues”

- Survey article
- Reliability vs. reliance
- Reliability & fault tolerance
- Fault -> Error (state) -> Failure (event)
- MTBF (MTTF), MTTR, MTTDL, Availability
Paper “Reliability Issues”

• Can you think of a fault-error-failure example?
• Repair of error vs. repair of fault
• Error detection & error recovery
• How are parity bits used for detection/recovery?

Paper “Reliability Issues”

• Faults:
  – HW, communication, timing, design, ...
  – Duration: permanent, transient
  – Extent: localized, distributed
  – Value: fixed, varying erroneous values
  – User error
    • What can we do to handle user errors?
Paper “Reliability Issues”

- Fault tolerance vs. fault avoidance
  - Examples of fault avoidance?
  - Examples of fault tolerance?
- Replication
- What are atomic actions?
- Levels of abstractions; interfaces
- Error detection
  - “Sanity check”
  - Consistency check (replication, TMR)
    - What assumption do we need to make about modules in TMR?
  - Reversal check
  - Coding (CRC, parity, Hamming, etc.)
  - Interface checking
  - Diagnostic checking

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**Triple Modular Redundancy (TMR)**
Paper “Reliability Issues”

- Fault treatment
  - Transient faults
  - Finding faults
  - Fault injection
  - Replacement and reconfiguration strategies
    - *What is “graceful degradation”?*
- Damage assessment
- Error recovery
  - Backward error recovery
  - Forward error recovery
  - *Pros/cons of backward & forward recovery?*

Summary “Reliability Issues”

- Fault, error, failure
- Detection errors and recovering from errors
- Redundancy, reconfiguration, backward/forward recovery, ...
- Different stages of “handling” errors/failures:
  - Design of system
  - Development of system
  - Testing of system
  - Operation of system
- Real-time systems: not just functionality, but also timing critical!