

Group Membership Assumptions



Robust Self-configuring
Embedded Systems

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X-by-Wire Design

Protocol services are proven correct, given assumptions

- How often do assumptions hold?
- How can we improve the protocol design?

Goal: Determine **viable design space** and make protocol **policy tradeoffs**

- Physical units: # Processors, # Channels (star, bus)
- Fault parameters: Fault types, Fault arrival rates
- Message traffic: Round length, Frame size, Bandwidth
- Design parameters: Diagnosis rate, Recovery time

Group Membership Service

- “The task of a *membership service* is to maintain a list of currently active, connected processes in a group” [Chockler et. al., “Group Communication Specifications”, ACM ‘01]
- Cornerstone of Byzantine fault tolerance policy

How well does group membership service withstand faults?

- Emphasis on transient faults - Bit Error Rate model
- Can permanent fault tolerance strategies handle transient?
- Scalability? Transient fault rate increases with traffic

Reliability Analysis

Use Markov analysis to determine how often assumptions hold

- Provides a conservative bound on group membership service reliability (With respect to fault model)

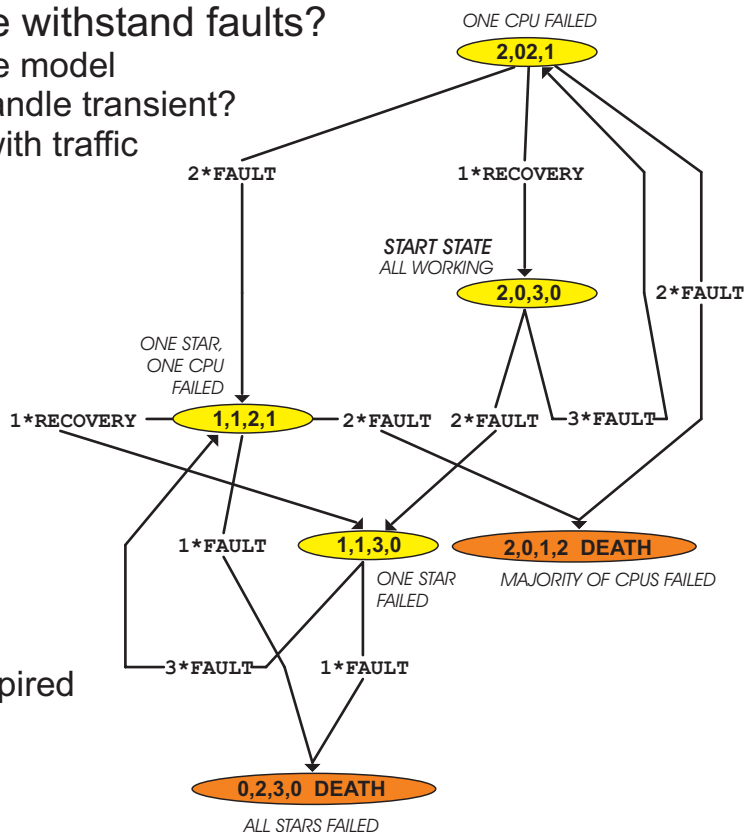
Example:

FAULT: A transient fault has occurred

RECOVERY: Transient fault effects have expired

CPU: Processor

STAR: Star coupler (or bus)



State space is (Good STAR, Faulty STAR, Good CPU, Faulty CPU)
Yellow: Operational states Orange: Group membership service failure

