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RAID (Inexpensive Arrays of Inexpensive drives) are computer storage systems consisting of a large number of disk drives which are deemed not reliable. However, collectively the reliability and speed of the system increases. RAID systems use ECC (Error Correcting Codes) so that the loss of one or more drives does not result in data loss.

As the computer storage needs rapidly increase, RAID will consist of a large number of drives (hundreds and thousands). As an individual disk loses data every few days, it is important to understand the reliability of RAID through mathematical modeling. Early models in this area are Markov chains, assuming equal and constant rate of failure for the drives. These models allow us to predict MTTDL (Mean Time To Data Loss).

A realistic model, however, must take into account repair schemes (replacement of broken drives, perhaps with a delay) and non-uniform failure rate of a drive with age (the inverted "bathtub curve"). In this talk, the resulting models will be discussed, which are systems of PDE, in which the number of equations is a random variable. Some systems will be rigorously analyzed, showing that the mathematics of these systems is both interesting and complex. (Received September 10, 2013)