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Criteria for Evaluating the Reliability of System Configurations for "long-term" Digital Preservation

Summary
Digital material are especially vulnerable to loss and corruption because they are stored on fragile magnetic and optical media that deteriorate rapidly and that can fail suddenly from exposure to heat, humidity, airborne contaminants or faulty reading and writing devices. Museums have very high reliability requirements for their digital materials compared to normal business conditions. Their problem is to achieve the politically given reliability goals with minimal costs. In this study we present effective methods to configure systems in order to ensure long-term data preservation.

Analytical modelling techniques are used to build models in order to evaluate the reliability of different system configurations for digital preservation. The results are very useful to support decisions like how many copies should be retained for each document, how frequently to check these copies for corruptions, what storage schemes are most effective for data preservation, what strategies are most effective for error recovery and repair, how many sites should be used in order to prevent from natural disasters such as flood, fire, earthquakes. We have conducted several sensitivity analysis runs for representative example cases, where differing values for input parameters are given and changes of reliability measures of interest are examined. Sensitivity analysis can be helpful in finding "major" factors that influence the reliability and cost of each configuration. The examples show that intuition may easily fail to estimate such factors.