TUM I 13
Chair of Application and Middleware Systems
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Tutorial
Distributed Systems (IN2259)

EXERCISES ON CAP THEOREM AND ERASURE CODING

EXERCISE 1 CAP Theorem

For each of the following scenarios, answer what kind of system is the most adequate for the situation (CA, CP, AP). Justify your answer.

(a) A global monitoring system for air traffic controllers. Each Air Traffic Control (ATC) client can request information about any flight. When an anomaly occurs, clients are required to be informed without delay in order to avert disasters. The air traffic controllers are directly connected to a dedicated optical fiber network with a Mean Time Between Failures (MTBF) of 500 years and six-nines availability.

(b) An online shopping website which is specialized in Christmas gifts. It only sells items once at the beginning of each month, at a heavy discount. Items are only guaranteed to be in time for Christmas, no matter when you order.

(c) The local branch of a bank wishes to record all operations performed at its ATMs. Because of security issues, this information cannot leave the physical boundaries of the office (e.g., through a network out of the bank, or with physical media).

(d) A promotional offer in a restaurant chain allows customers to use a raffle app on their phone to obtain a prize if their bill exceeds a minimum amount. The grand prize is a new car. The app is controlled by the restaurant company and the promotion operates under a strict global budget which cannot be exceeded. If there are any technical issues with the app, a rain check ticket is given to the customers so that they can come back later to check and claim their prize.

EXERCISE 2 Reed Solomon Error Correction

A data center makes use of 6 storage servers to store a set of data. The storage manager breaks down the data into shards and stores them across all storage servers. Furthermore, the storage manager utilizes Reed-Solomon encoding for generating and storing parity shards for original data, which are used to recover the corrupted data.

(a) Divide the text "Reed Solomon Err" into four shards and create the parity shards by using the following encoding matrix. (**Hint:** Use the ASCII Table to convert the string to decimal values. `http://www.asciitable.com/`)

$$\begin{bmatrix} 01 & 00 & 00 & 00 \\ 00 & 01 & 00 & 00 \\ 00 & 00 & 01 & 00 \\ 00 & 00 & 00 & 01 \\ 27 & 28 & 18 & 20 \\ 28 & 27 & 20 & 18 \end{bmatrix}$$

(b) Imagine that the first two shards of the original data are corrupted due to storage server failures. Recover the original data according to the encoding matrix and the stored parity shards.