

ARBITRAGE

DEFINATION

Defination 1: Arbitrage is the process of exploiting differences in the price of an asset by simultaneously buying and selling it.

Defination 2: Arbitrage is the process of simultaneous buying and selling of an asset from different platforms, exchanges or locations to cash in on the price difference (usually small in percentage terms).

EXAMPLE

- ❑ Open with \$1,000,000 USD.
- ❑ Canadian dollar buy USD dollar.
- ❑ Swiss Franc. buy Canadian dollar.
- ❑ Again USD dollar buy Swiss France.
- ❑ Close with \$1,001,005.22.
- ❑ And then obtain the profit of \$1,004.24.



ALGORITHM

We can use BELLMAN-FORD algorithm on a suitable weighted.

- $G=(V,E)$ directed graph which we forms as follows:

- One vertex in V for each currency and the pair of currencies (c_i and c_j).

- And edge E between the every pair of currencies (v_i,v_j) and (v_j,v_i).

- Thus, $|V|=n$ and $|E|=n(n-1)$

Suppose we can give n currencies $c_1,c_2,c_3,c_4,\dots,c_n$ and $n*n$ table R of exchange rates, Such that One unit of currencies c_i buys $R(i,j)$ unit of currency c_j .

We are find the cycle in the graph to perform the arbitrage process.

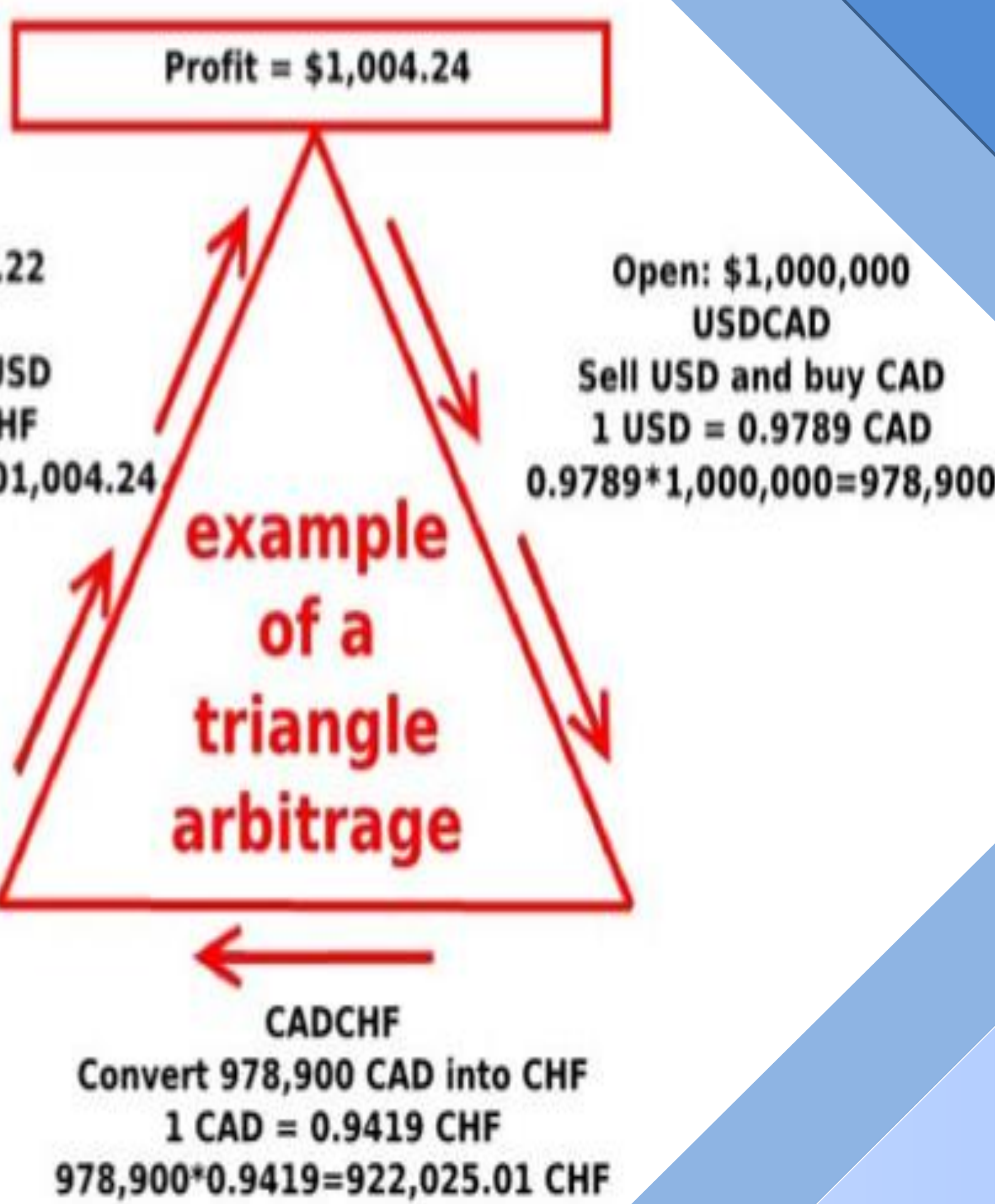
$R[i1,i2]\cdot R[i2,i3]\dots R[ik-1,ik]\cdot R[ik,i1]>1$.
Taking logarithms on both sides,

$\lg R[i1,i2]+\lg R[i2,i3]+\dots+\lg R[ik-1,ik]+\lg R[ik,i1]>0$.

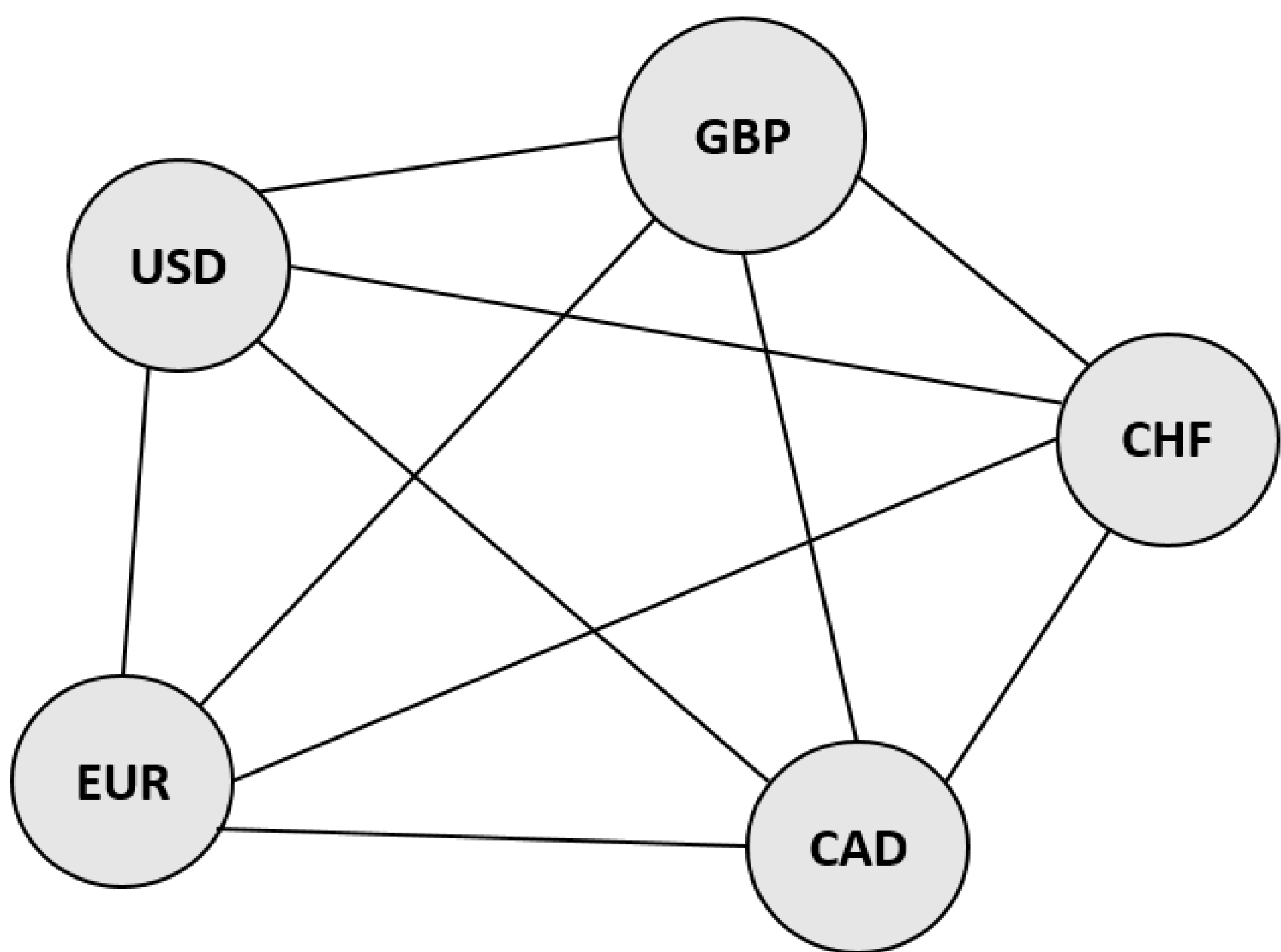
If we negate both sides , we get

$(-\lg R[i1,i2])+(-\lg R[i2,i3])+\dots+(-\lg R[ik-1,ik])+(-\lg R[ik,i1])<0$.

And so we want to determine negative weight cycle.



ARBITRAGE WITH BELLMAN FORD



We have to construct a graph like this. The vertices will be the currencies. Of course there is a connection between all of them.

COURSE: DATA DESIGN AND ALGORITHM
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