# A fast distributed $2+\epsilon$ approximation for weighted vertex cover*

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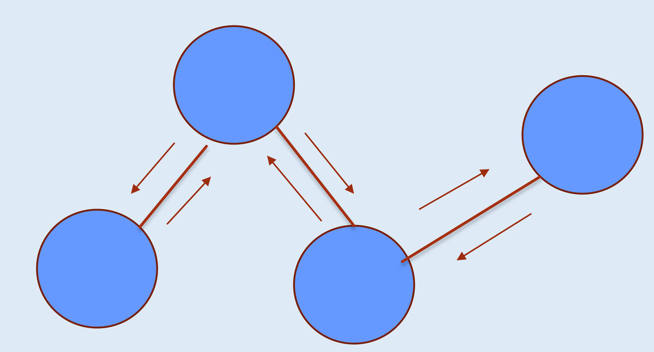
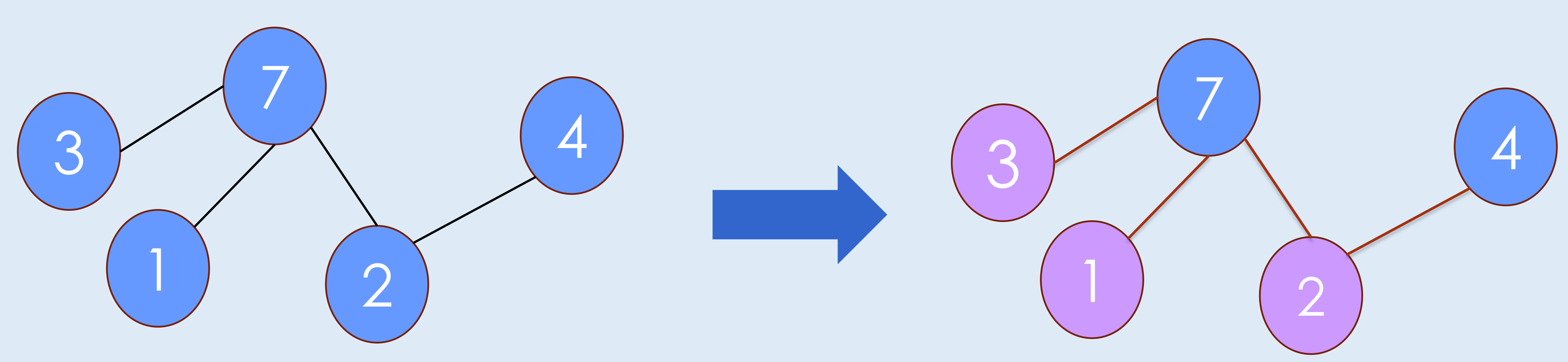
## Model

- A network of computers that send messages in synchronous rounds



## The problem: Vertex cover

- Find a set of nodes of minimal cost that covers all edges

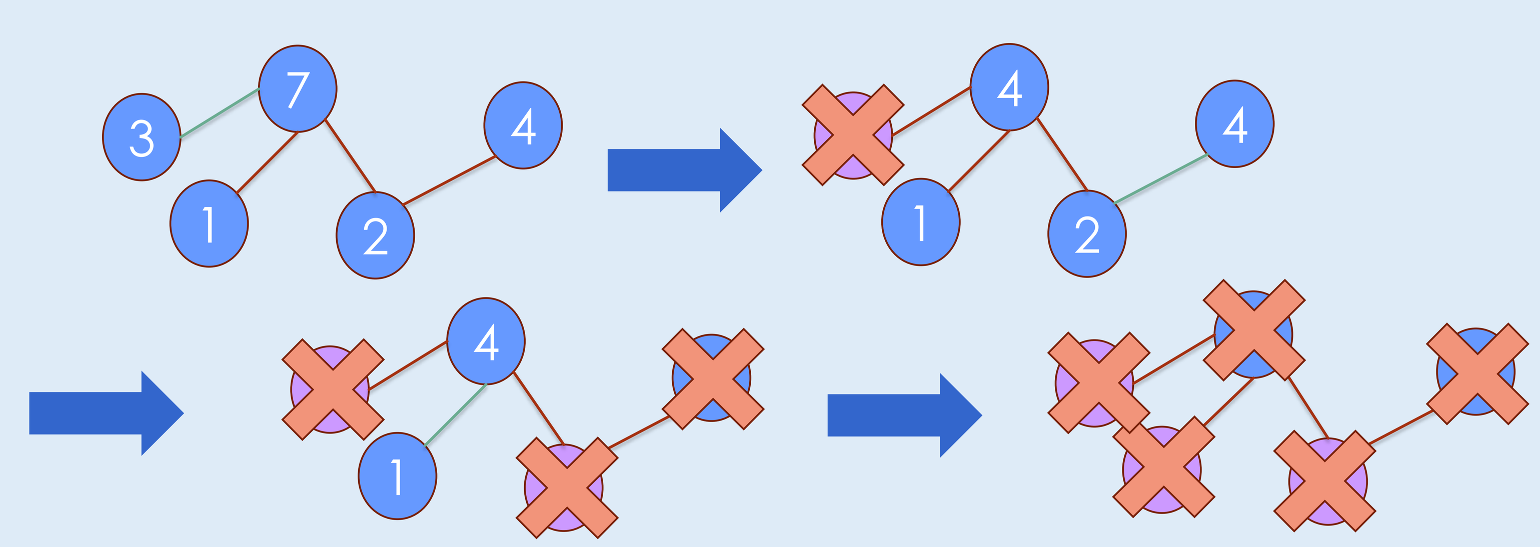



NP-hard, but a 2-approximation exists!

## A sequential 2 approximation

- Choose an edge and remove the minimal weight between its endpoints from both endpoints
- Vertices with weight zero are free, add them!
- Repeat

*Adding a vertex to the cover when its weight is an $\epsilon$-fraction of its original weight results in a $2+\epsilon$ approximation.



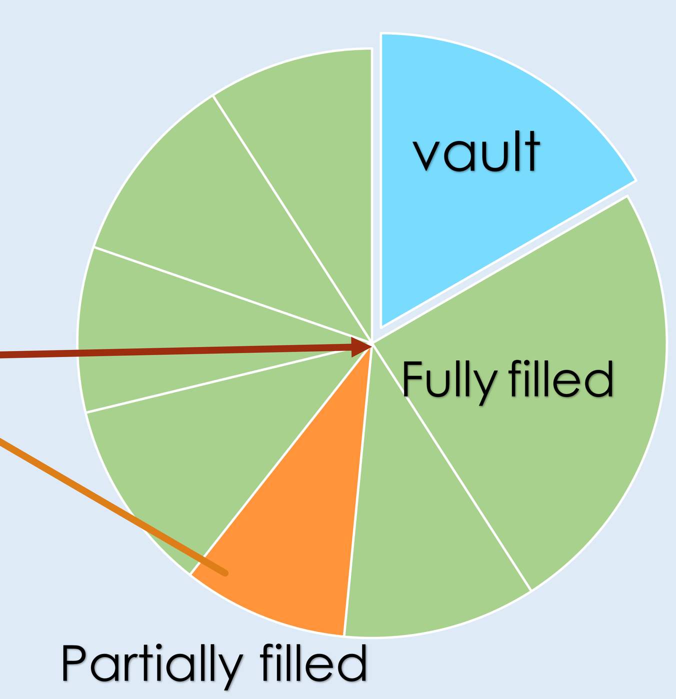
Can be distributed!

## A distributed $(2+\epsilon)$ approximation


Split the weight of the vertex

Offers are made by vault, bank responds

When the weight goes below $\epsilon w_0$, add to cover




## Analysis

There exists a tradeoff between weight and degree reductions

$O(\frac{\log\Delta}{\epsilon\log\log\Delta})$ rounds

This is tight for constant $\epsilon$!

*Maximal node degree is $\Delta$