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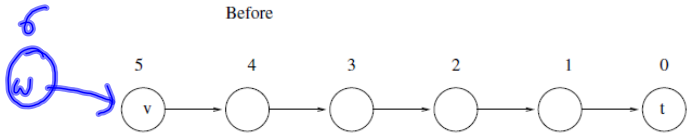
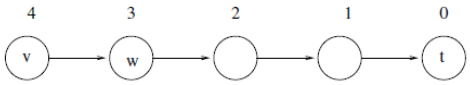
How could this happen?

Before



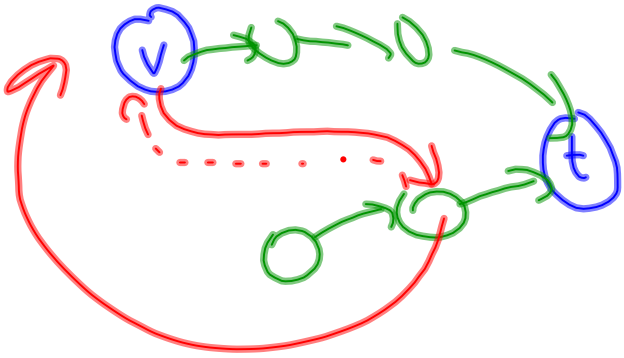
After



- $(v, w) \in G_f'$ but not in G_f . (why?)
- We must have sent flow on (w, v) in the augmenting path
- $\delta(w) = 6$
- $\delta'(w) < \delta(w)$, which contradicts v being the minimum vertex whose label decreased.

Conclusion: $\delta(v)$ never decreases.

Feb 23-11:00 AM



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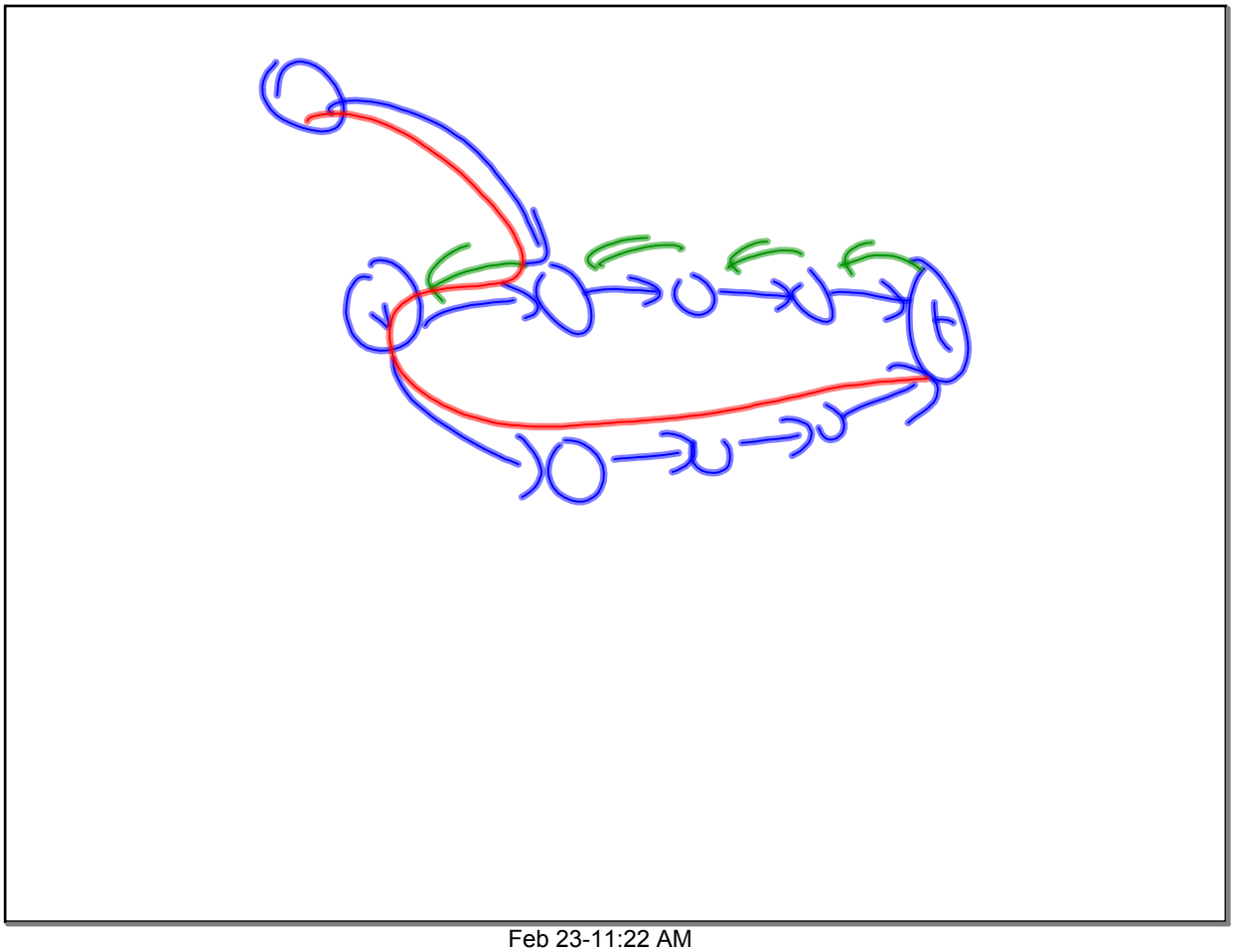

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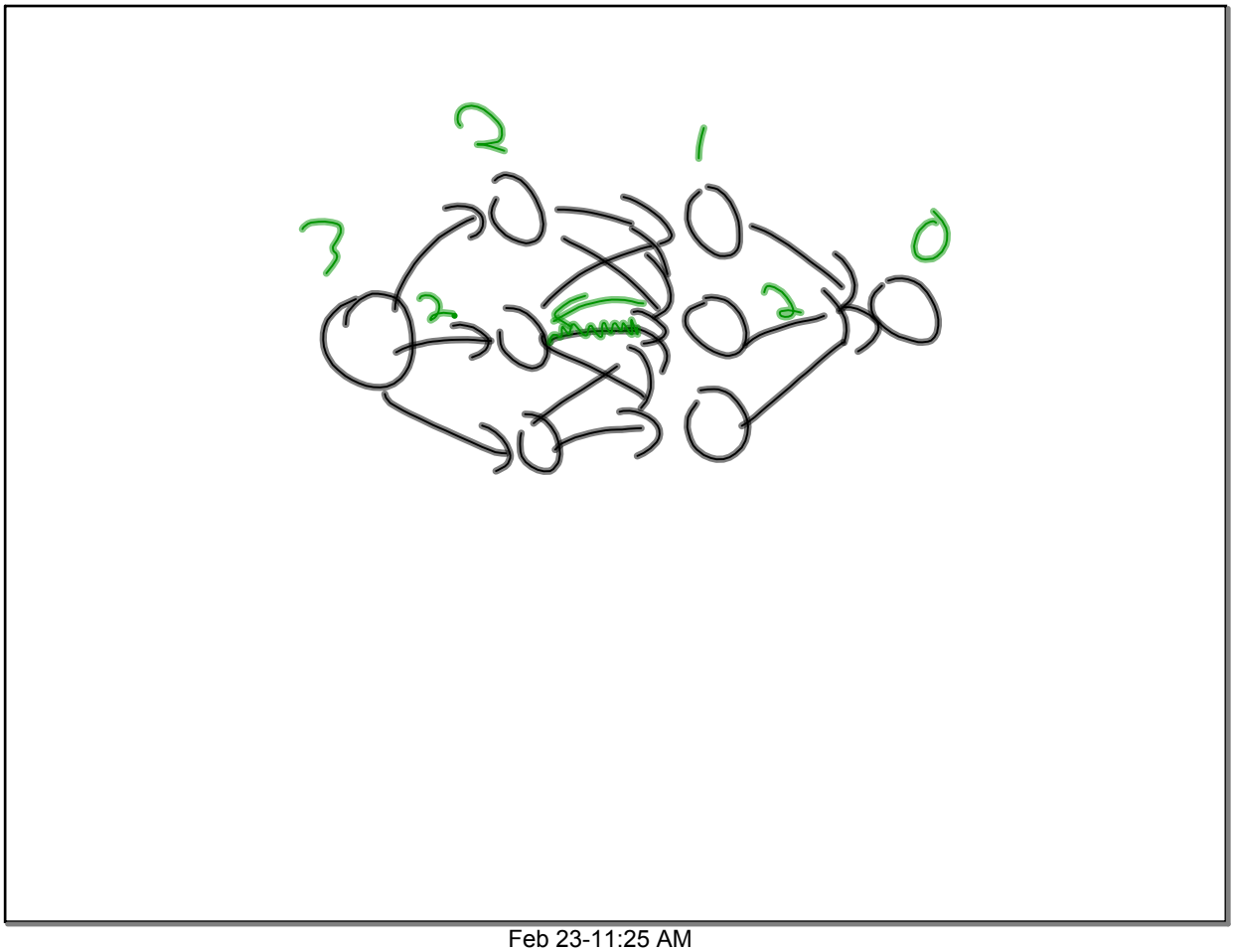

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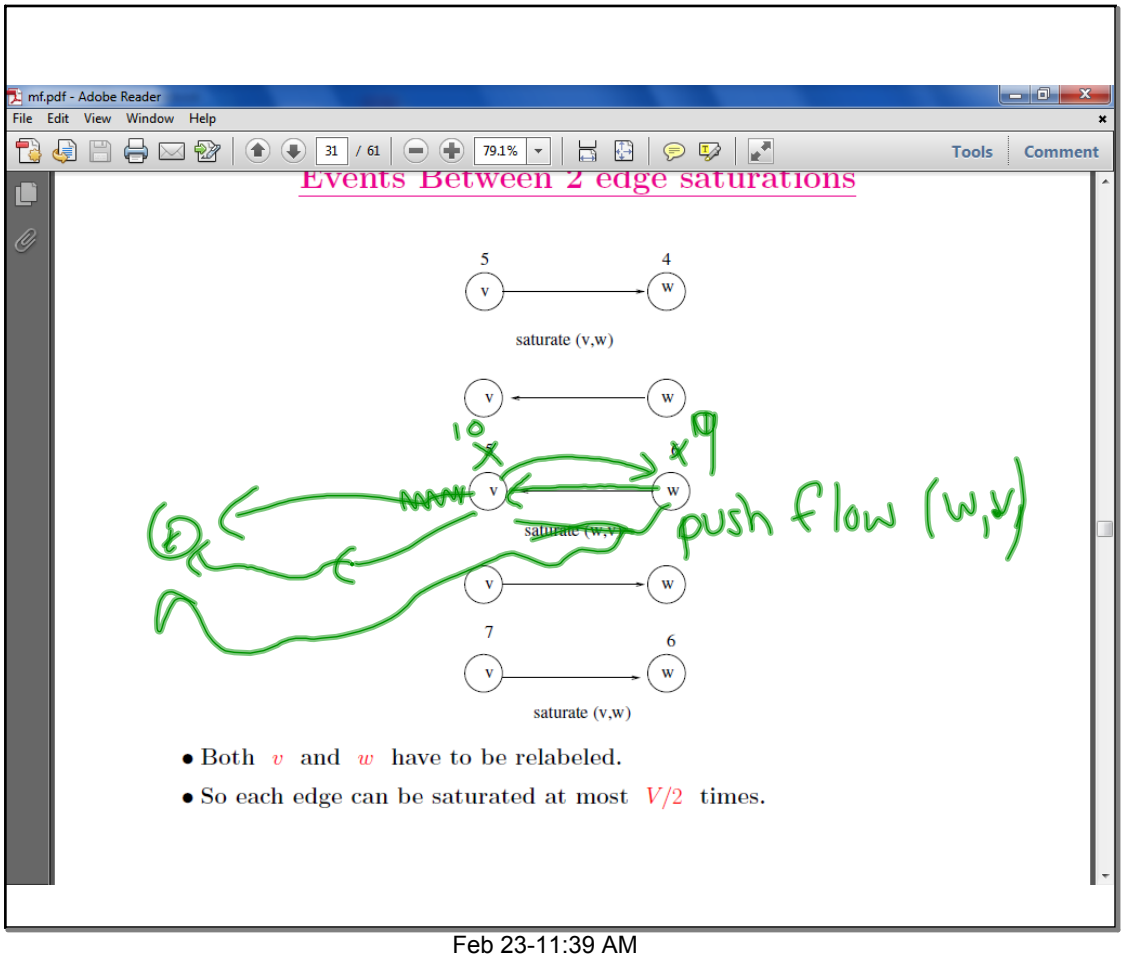

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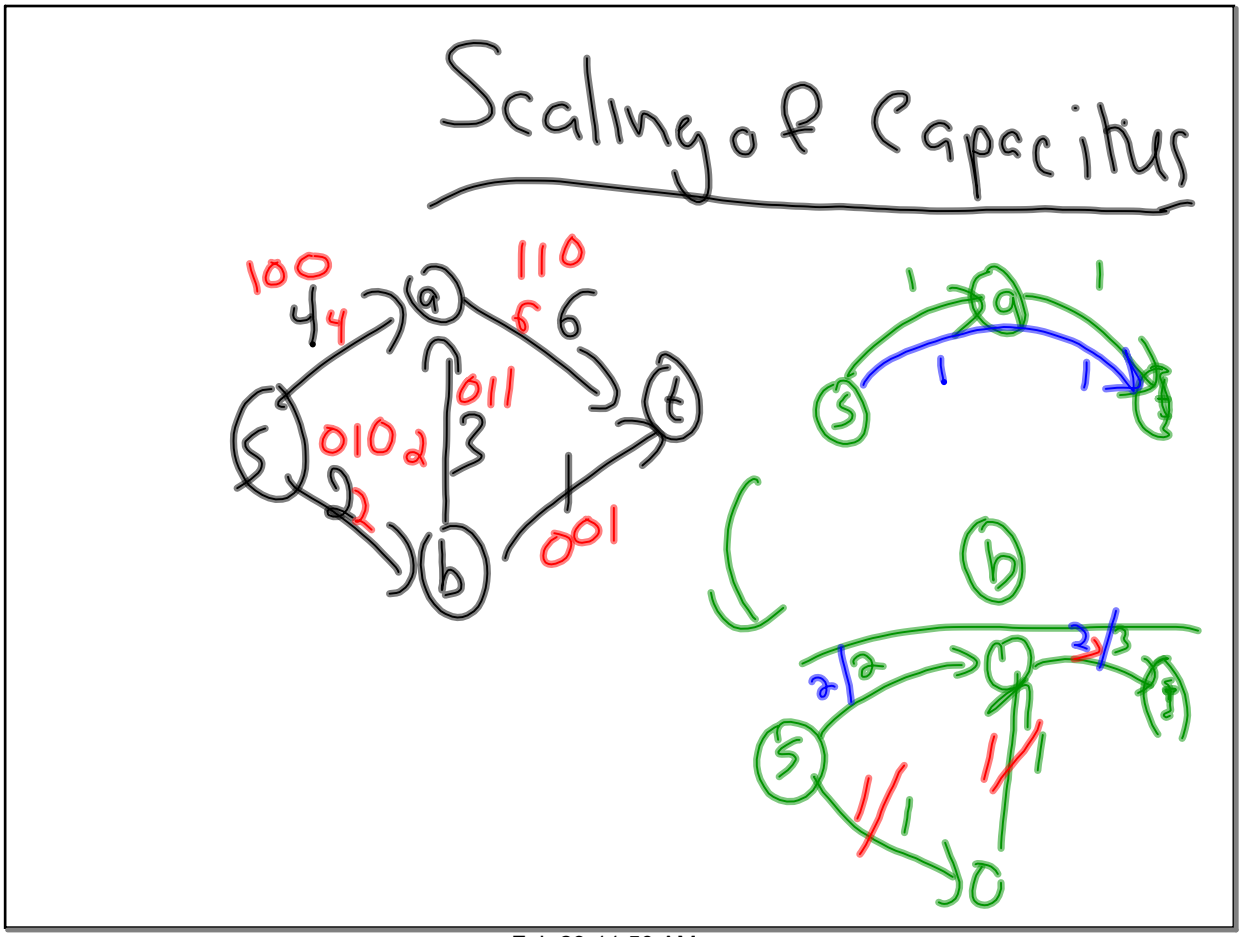

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Repeat

- double current flow
- add a bit of capacity
- solve max flow problem

lg C iterations

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- doubling flow, add a bit of capacity maintains feasibility
- last iteration computes a max flow

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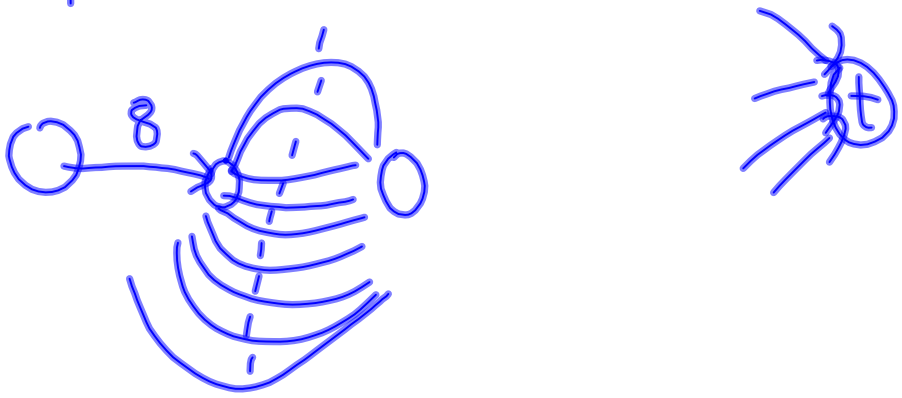
If you started an iteration w/

$c_f(v,w) \leq 1 \quad \forall (v,w)$

immediate bound of n iterations



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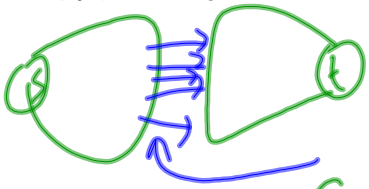
Claim: let G_f be the res. graph at the beginning of a scaling iteration. i. Let f' be a max flow in G_f. Then $|f'| \leq m$.

Pf: Look at min cut in the solution to iteration $i-1$.



$c_{f_{i-1}}(v,w) = 0$

At the beginning of iter i. $c_{f_i}(v,w) = 0$ or 1

For cut X, the total res. cap. $\leq m$

$\Rightarrow$ min cut " " " $\leq m$

$\Rightarrow$ max flow in $G_{f_i} \leq m$ ⊗

$\Rightarrow$ need $\leq m$ aug. paths

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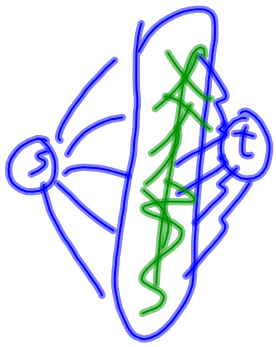
$O(m^2 \lg U)$

careful

$O(mn \lg U)$



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