Solution5BeautifulVersion

Lemma1:

> Both edges e22 e11 should be cut by all the min cuts.
> ($\forall C$ u_1 and u_2 $\in$ S and v_1 and v_2 $\in$ T)

Proof contradiction:
If they didn't than when we raised the capacities the maximum flow would not have increased because there would have existed a min cut which capacity value did not change. But the max flow value increased. This is a contradiction.

Lemma2:

> Even after raising the capacity for e22 and e11 all the min cuts still remained min cuts.

Proof:
Before: c(min cuts)=val(f_{min})
After raising the capacity: val(f'_{min})=c(C'_{min})=c(min cuts)+the new capacity.

Corollary:

> The second largest capacity of a cut (int original graph) differs by >=+(2*32) from the value of the min capacity.

This tells us that until we don't change the capacity of the min cuts more than >=+(2*32) the flow will change the same amount.

The e12 and e21 also are cut by all the min cuts ($\forall C$ u_1 and u_2 $\in$ S and v_1 and v_2 $\in$ T) => changing their value changes the min capacity of the cut.

=> max(f)=21+31-13=39.