
15.082 and 6.855J

Flow Decomposition

begin

Initialize

while $y \neq \emptyset$ **do**

begin

Select(s, y)

Search(s, y)

if a cycle C is found then do

begin

let $\Delta = \text{Capacity}(C, y)$

Add Flow(Δ, C) to cycle flows

Subtract Flow(Δ, C) from y.

end

if a path P is found then do

begin

let $\Delta = \text{Capacity}(P, y)$

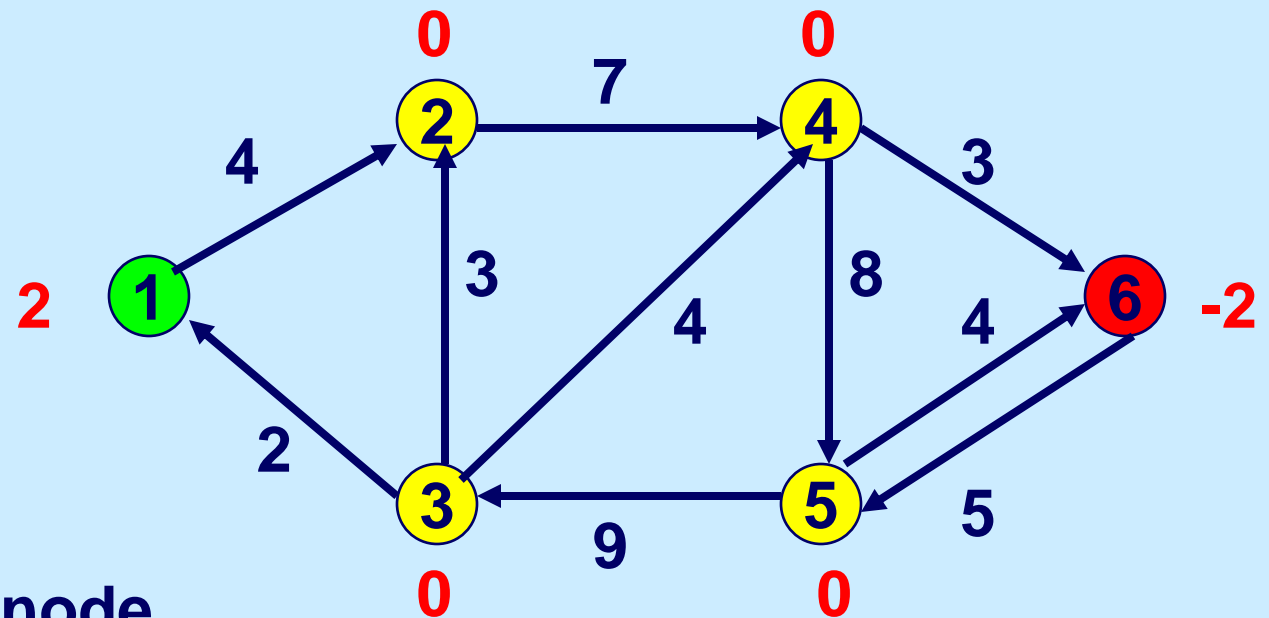
Add Flow(Δ, P) to path flows




Subtract Flow(Δ, P) from y.

end

end

The initial flow



-  A supply node
-  A demand node
-  A balanced node

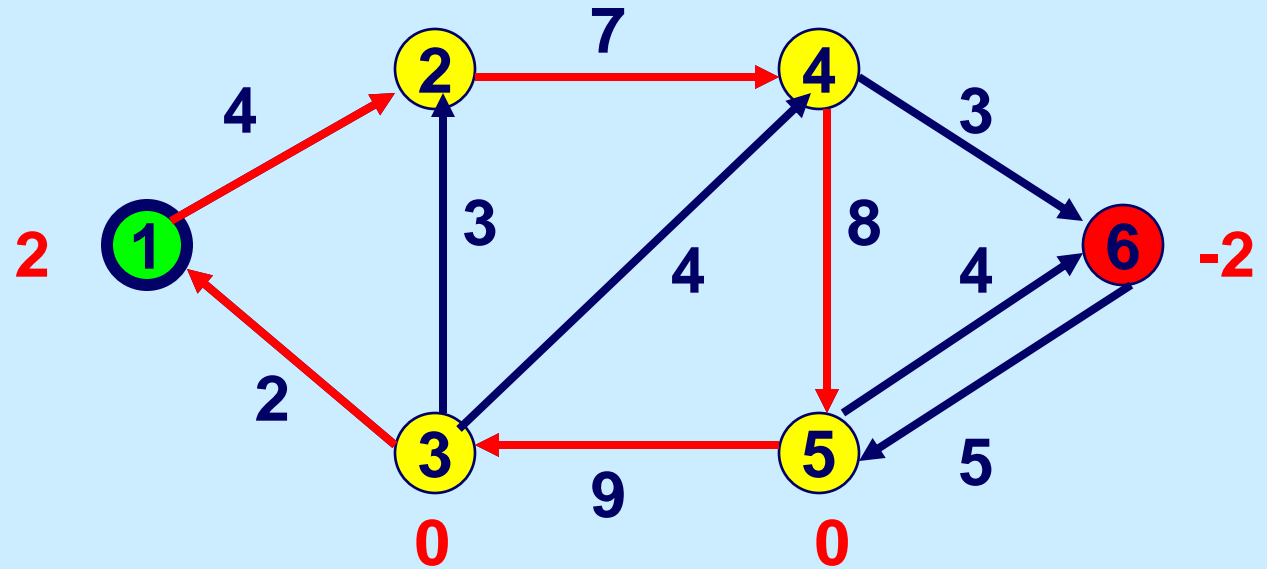
The flow x

Find a Path or Cycle

Carry out a depth first search until a cycle C or a path P is found

Determine the capacity

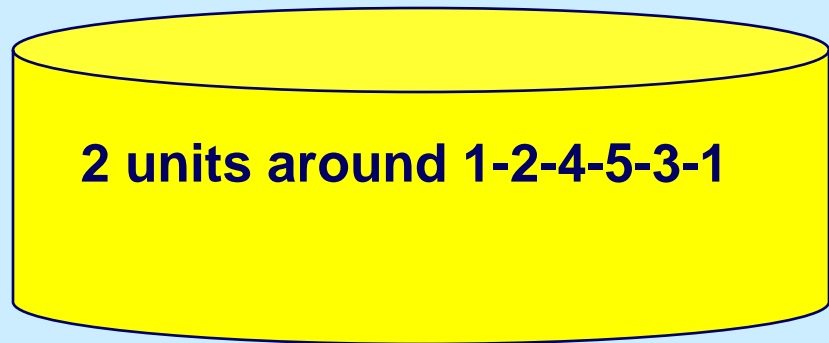
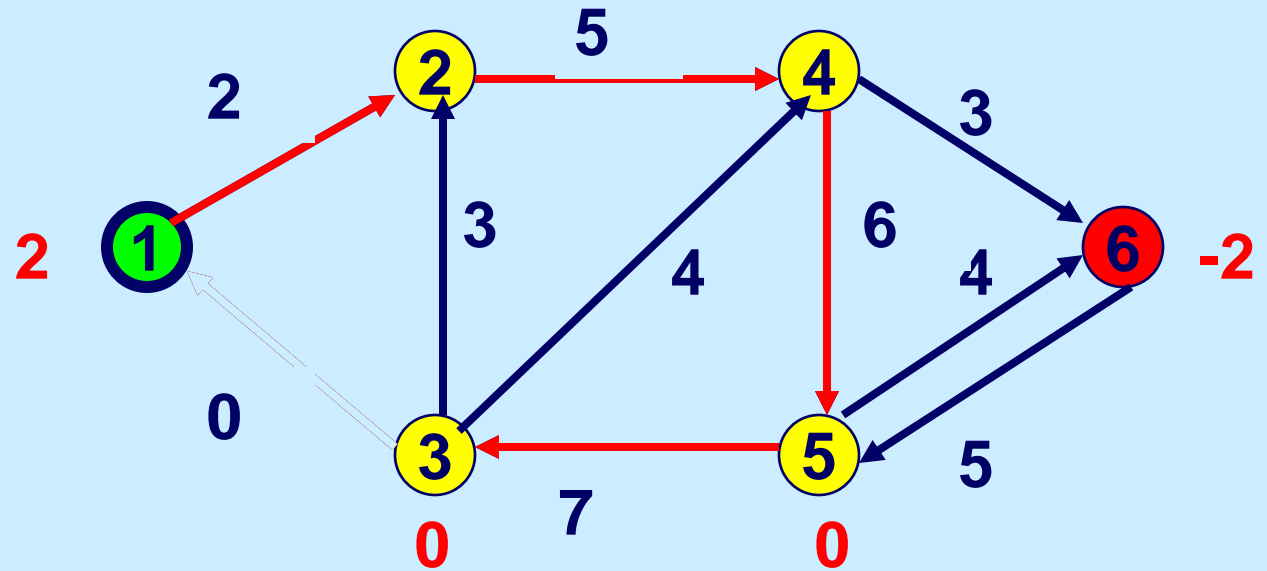
The capacity is 2.



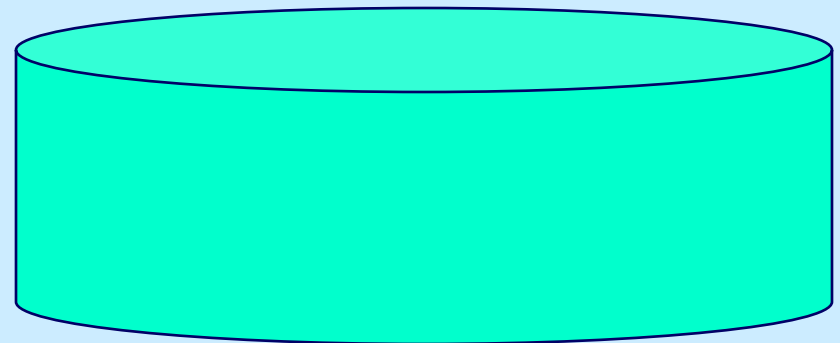
Update the decomposition

Add the cycle flow to the decomposition

update the current flow



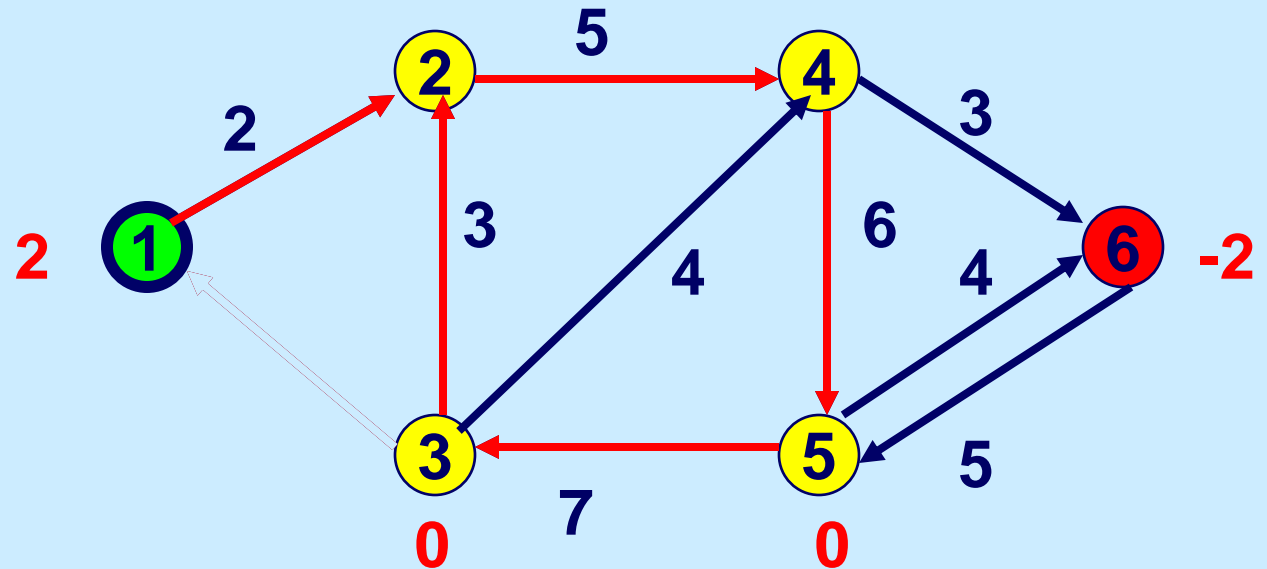
cycle flows



path flows

Find the next path or cycle

Start at a supply node and find the next cycle or path



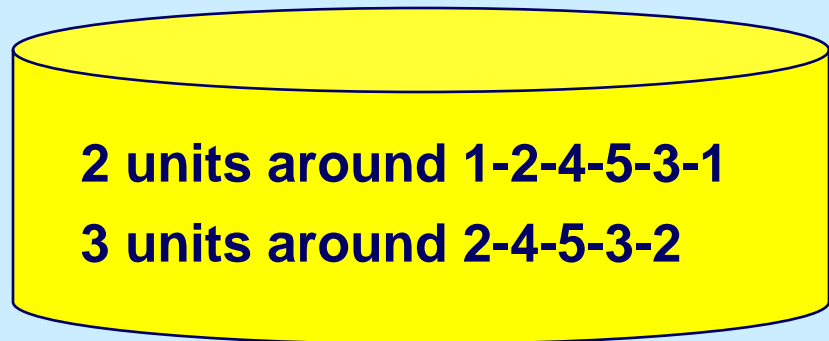
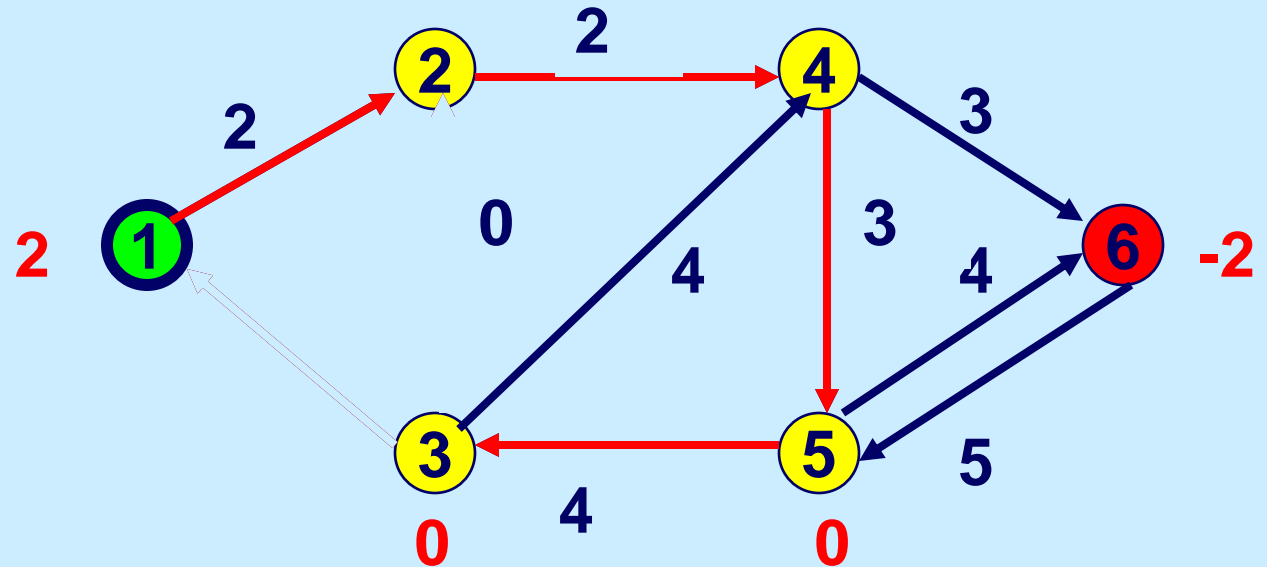
2 units around 1-2-4-5-3-1

cycle flows

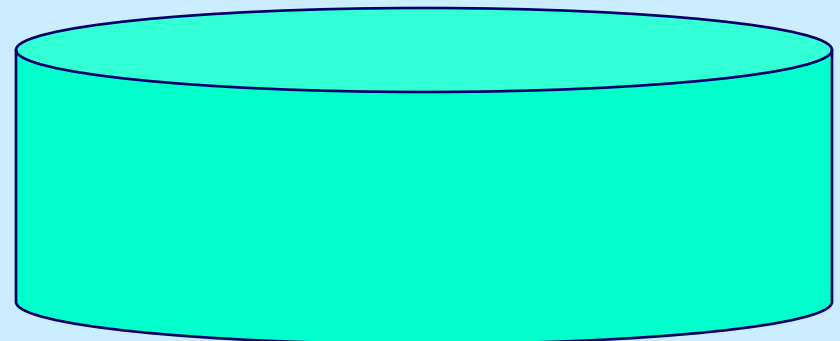
path flows

update the decomposition and current flow

update the current flow and decomposition



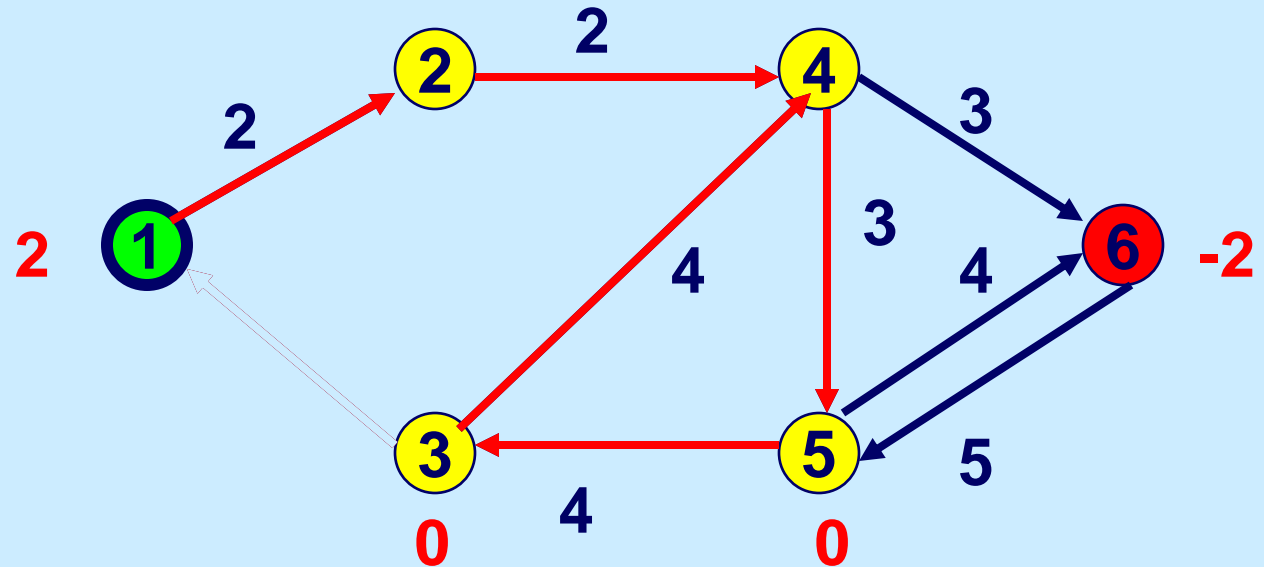
cycle flows



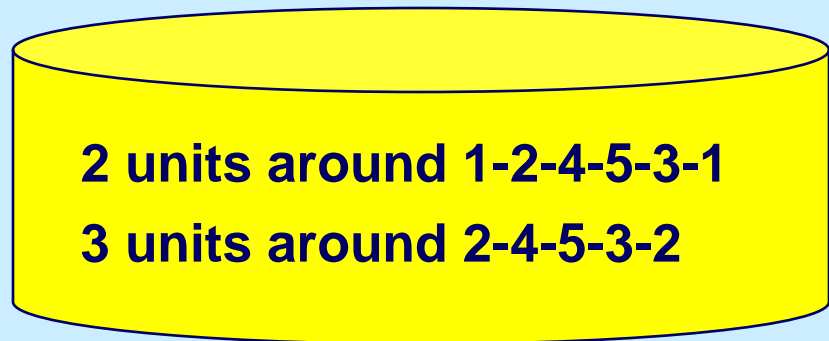
path flows

Find the next flow or cycle

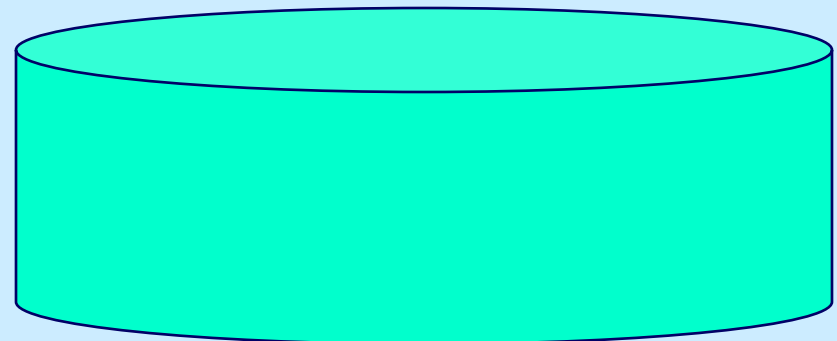
start with a supply node and find the next flow or cycle.



The capacity of 4-5-3-4 is 3



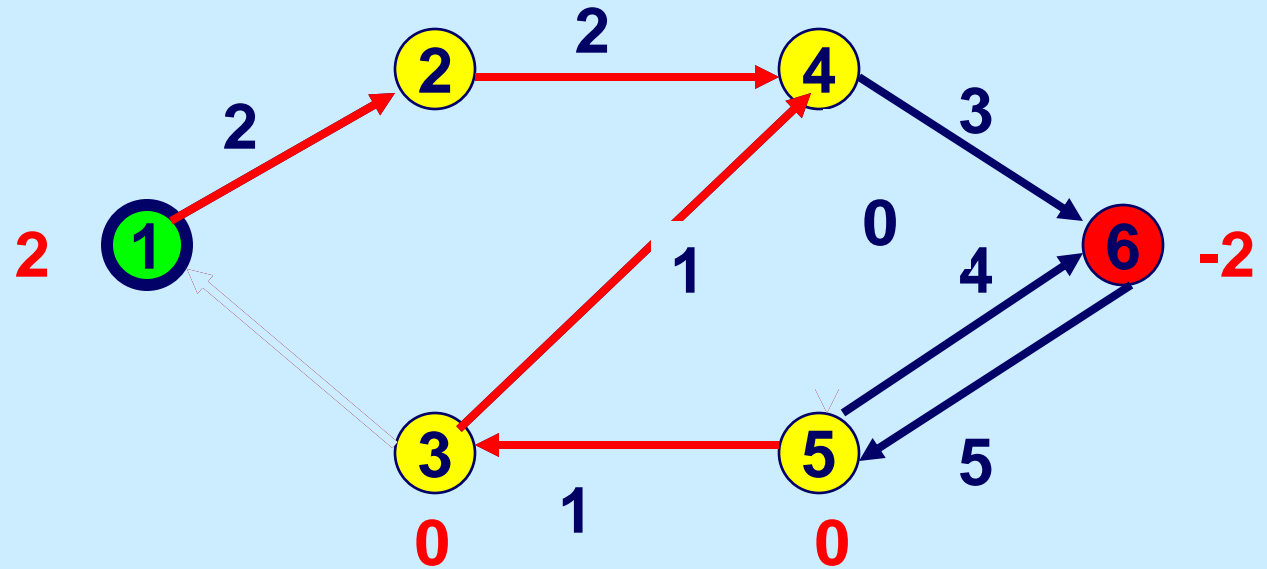
cycle flows



path flows

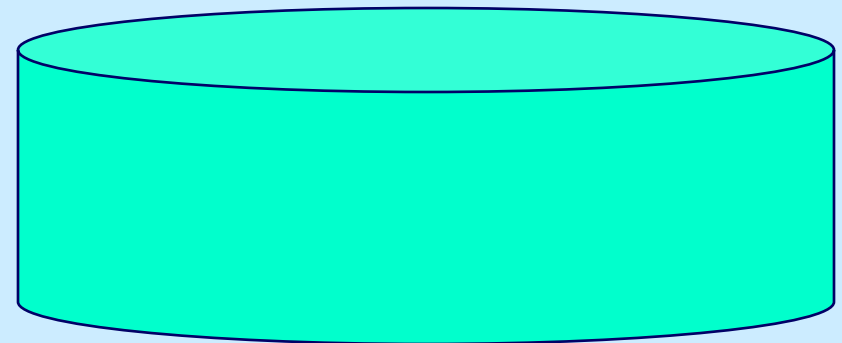
Update

update the
current flow
and
decomposition



2 units around 1-2-4-5-3-1
3 units around 2-4-5-3-2
3 units around 4-5-3-4

cycle flows

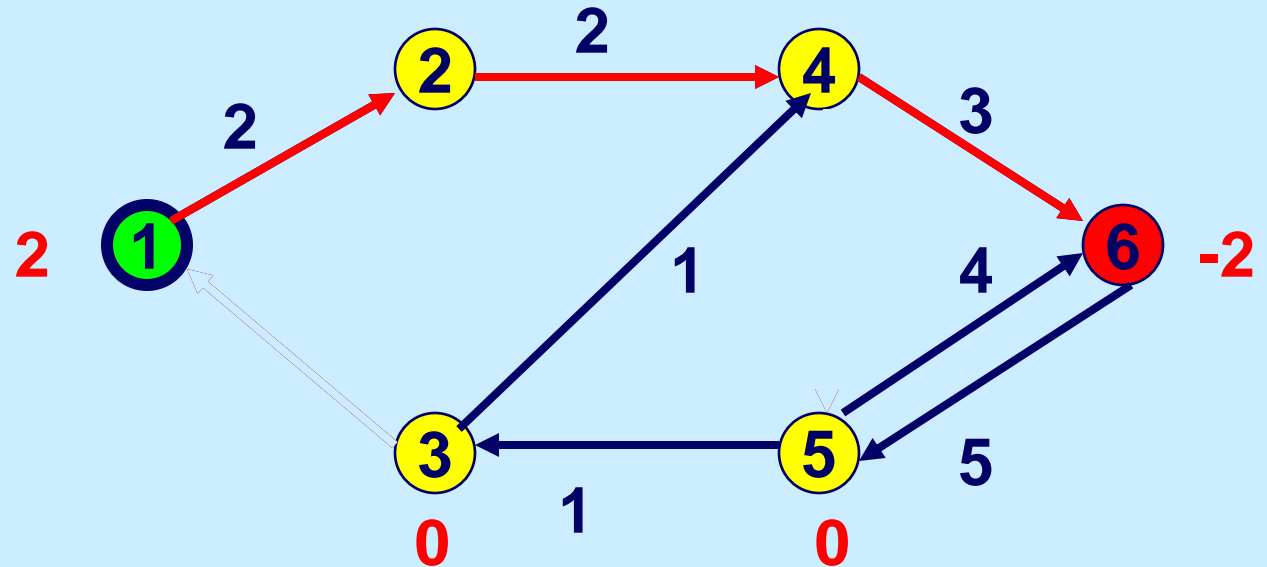


path flows

Find the next flow or cycle

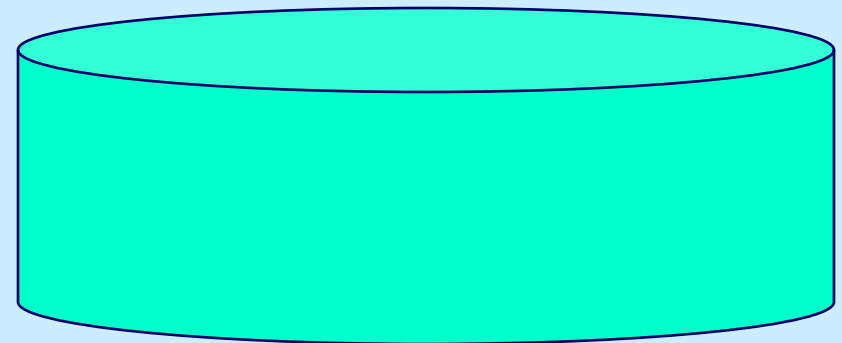
start with a supply node and find the next flow or cycle.

The capacity of 1-2-4-6 is 2



2 units around 1-2-4-5-3-1
3 units around 2-4-5-3-2
3 units around 4-5-3-4

cycle flows

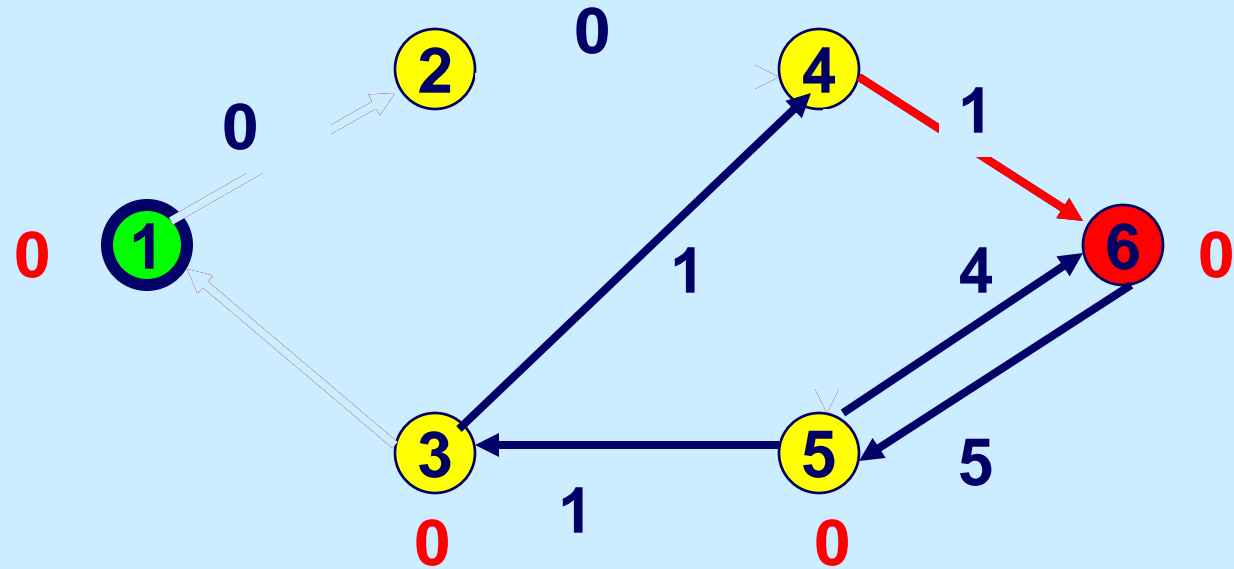


path flows

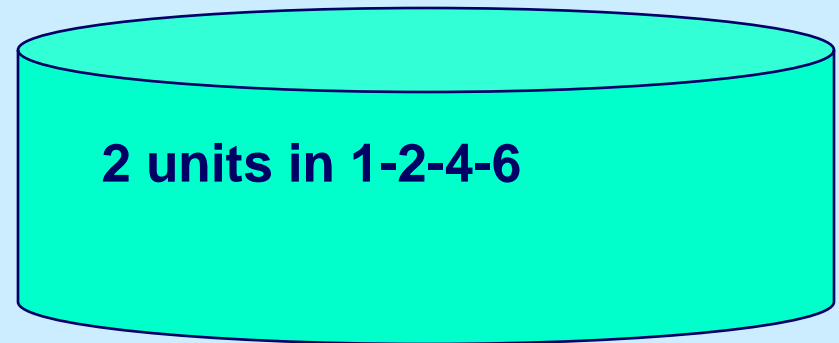
10

Update

update the current flow and decomposition



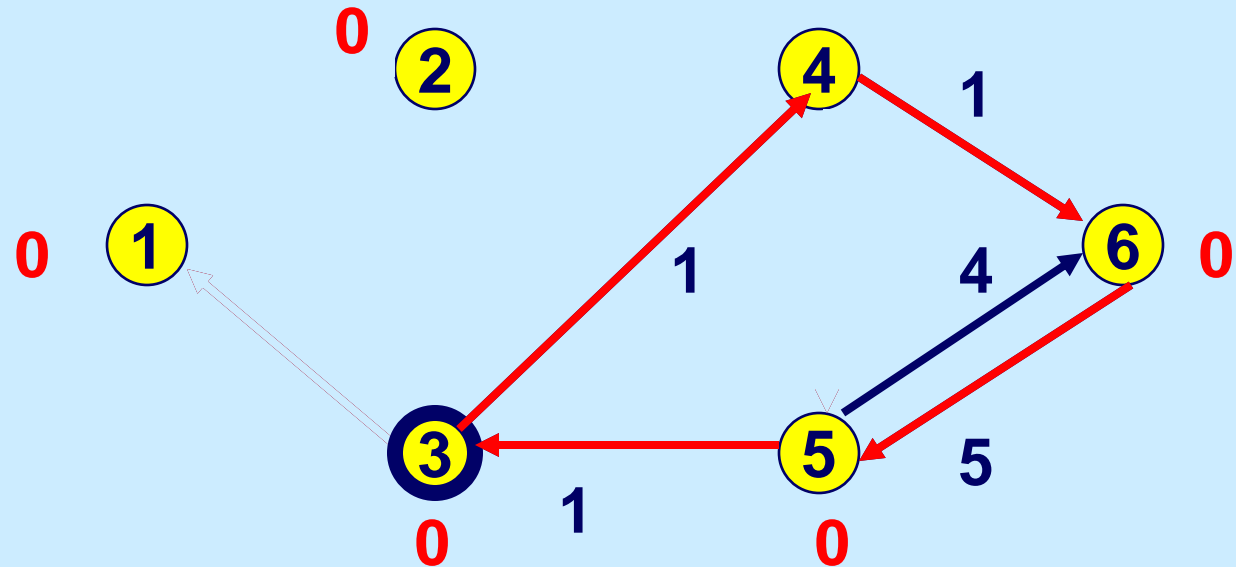
cycle flows



path flows

Find the next path or cycle

start with any node incident to an arc with flow and find the next flow or cycle.



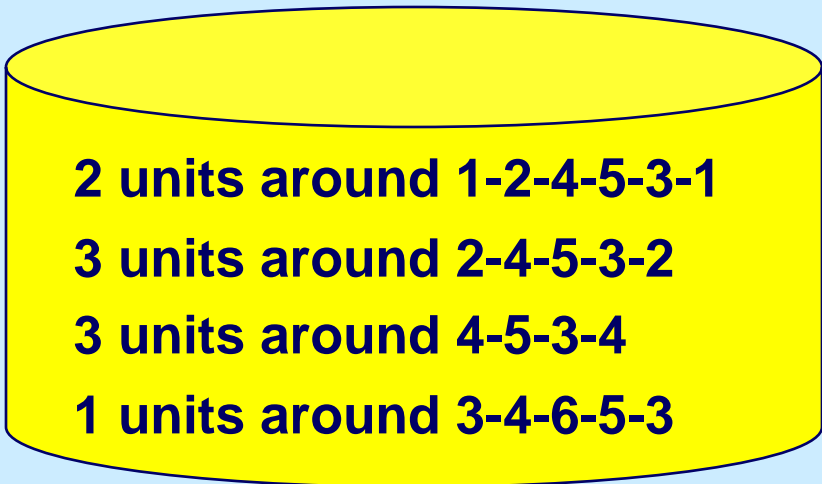
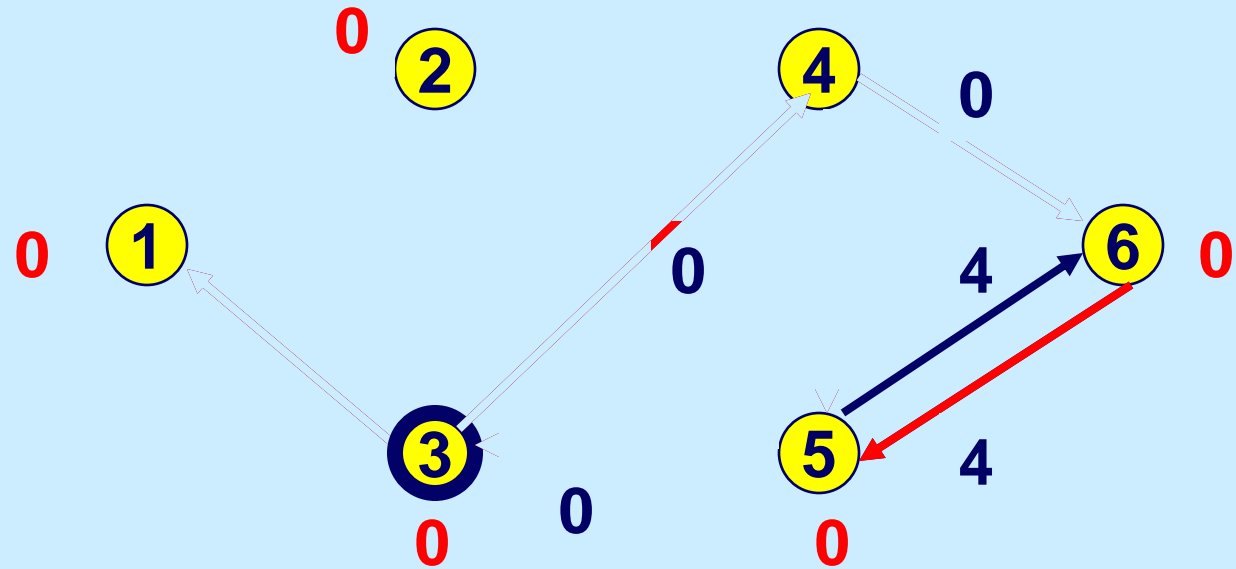
2 units around 1-2-4-5-3-1
3 units around 2-4-5-3-2
3 units around 4-5-3-4

cycle flows

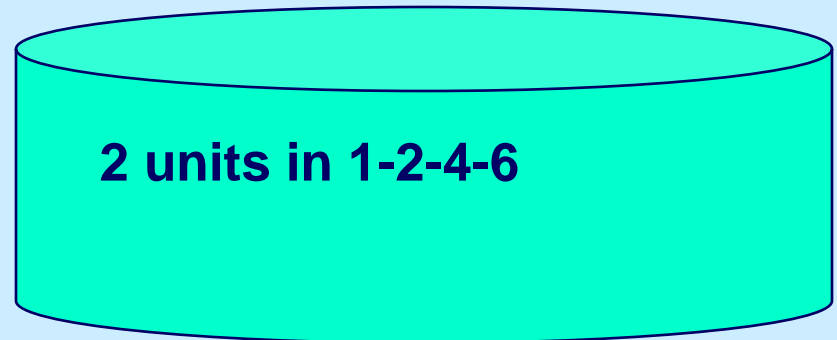
2 units in 1-2-4-6

path flows

Update



cycle flows



path flows

The Final Decomposition

