

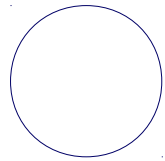
Ope. Operation
number



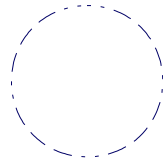
The location indicated
by the hash value



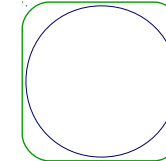
Insertion of a
new key-value pair



Element storing
key-value



Empty element



Moving stored
key-value pair

→ 'next' locator

← 'prev' locator



Cutting a connection of locator.

$_f$: first index indicated by the symbol of

$_e$: empty element's index indicated by the symbol of

prevIdx_X : element index before ' $_X$ '.

idx_X : element index.

nextIdx_X : element index after ' $_X$ '.

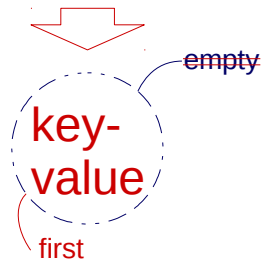
prev_X : distance between 'prev' and ' $_X$ '.

next_X : distance between 'next' and ' $_X$ '.

prev2next_X : distance between 'prev' and 'next'.

Next page is '**insertion case01 (hard)**'.

Ope. 1. New insertion of a key-value pair.

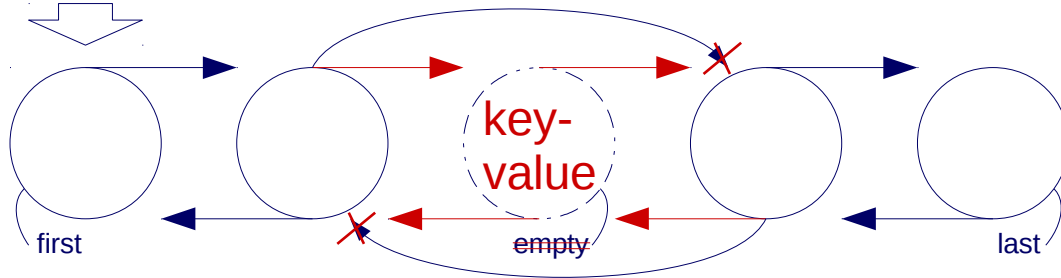
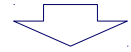


Next page is **'insertion case02 (hard)'**.

Ope. 1. New insertion of a key-value pair.



Ope. 0. 4 key-value paris are already inserted.

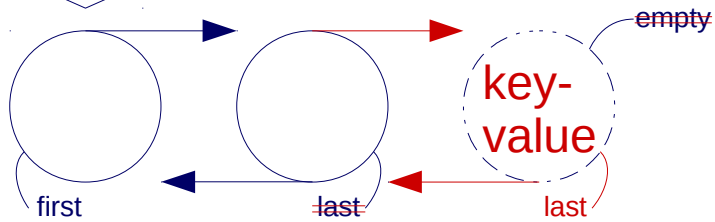
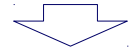


Next page is '**insertion case03 (hard)**'.

Ope. 1. New insertion of a key-value pair.

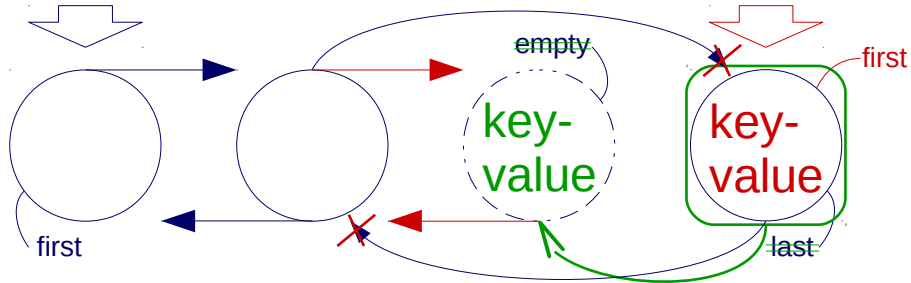


Ope. 0. 2 key-value pairs are already inserted.



Next page is '**insertion case04 (hard)**'.

3 key-value pairs
are already inserted.



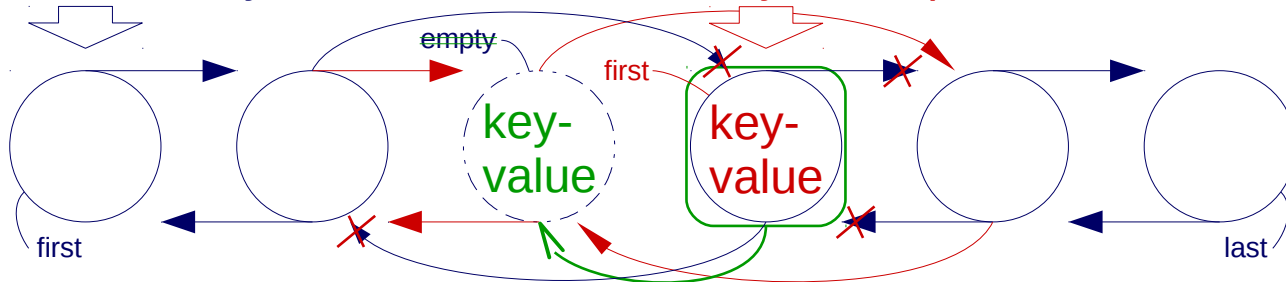
New insertion of a key-value pair.

Ope. 1. Moving stored key-value pair.

Next page is **'insertion case05 (hard)'**.

Ope. 0.

5 key-value pairs
are already inserted.



Ope. 2.

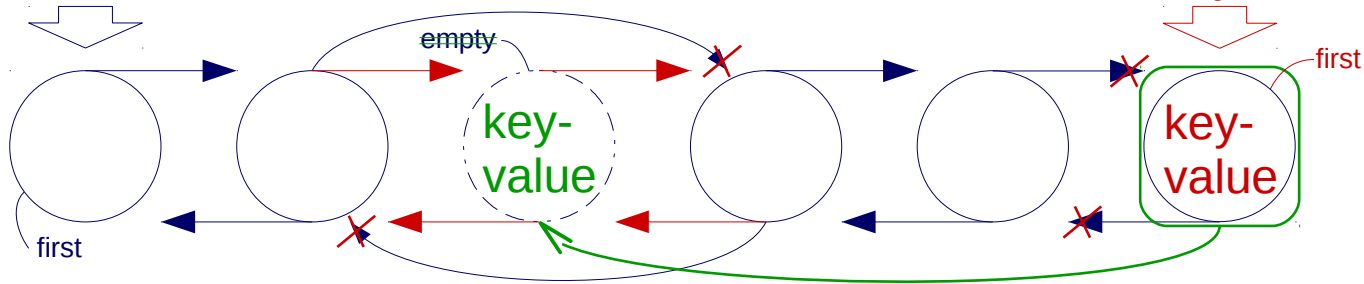
New insertion of a
key-value pair.

Ope. 1. Moving stored key-value pair.

Next page is '**insertion case06 (hard)**'.

Ope. 0.

5 key-value pairs
are already inserted.



Ope. 2.

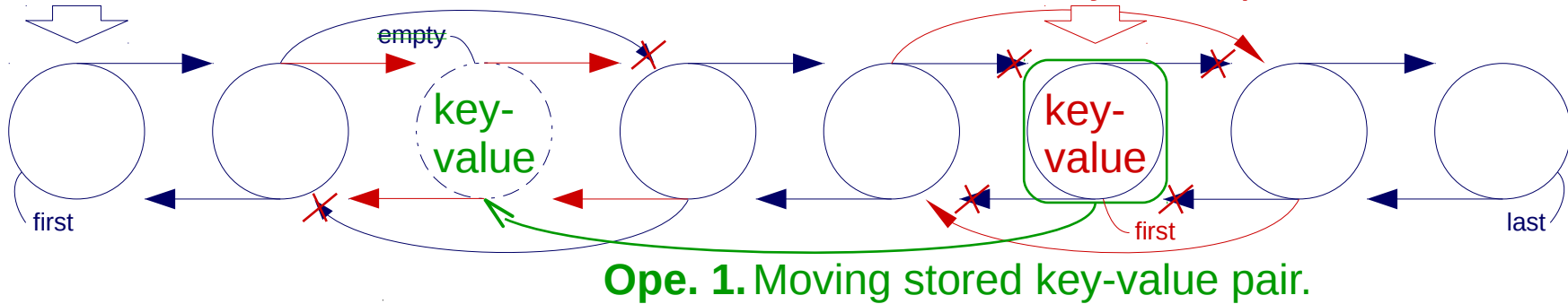
New insertion of a
key-value pair.

Ope. 1. Moving stored key-value pair.

Next page is '**insertion case07 (hard)**'.

Ope. 0.

7 key-value pairs
are already inserted.



Ope. 2.

New insertion of a
key-value pair.

Ope. 1. Moving stored key-value pair.

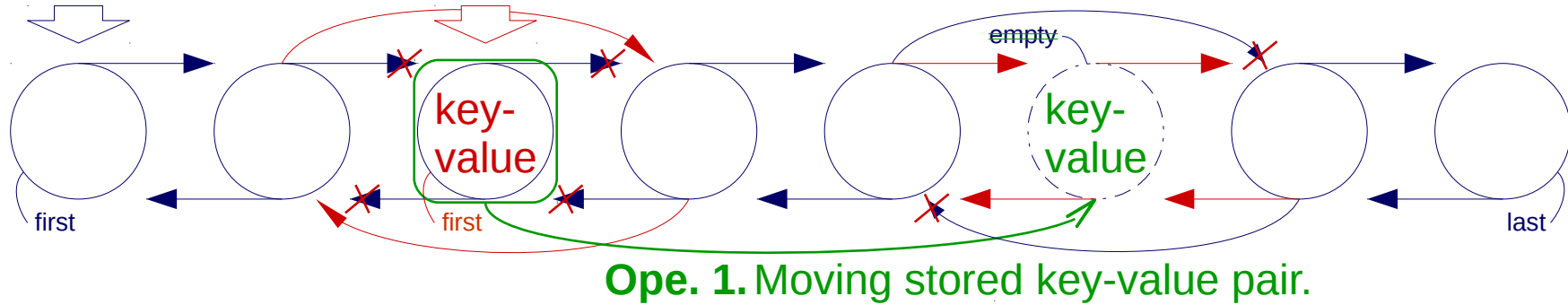
Next page is '**insertion case08 (hard)**'.

Ope. 0.

7 key-value pairs
are already inserted.

Ope. 2.

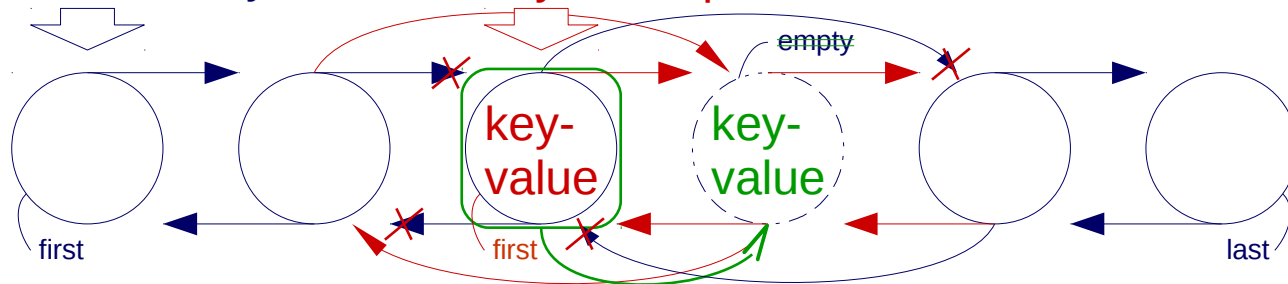
New insertion of a
key-value pair.



Next page is '**insertion case09 (hard)**'.

5 key-value pairs are already inserted.

New insertion of a key-value pair.



Ope. 1. Moving stored key-value pair.

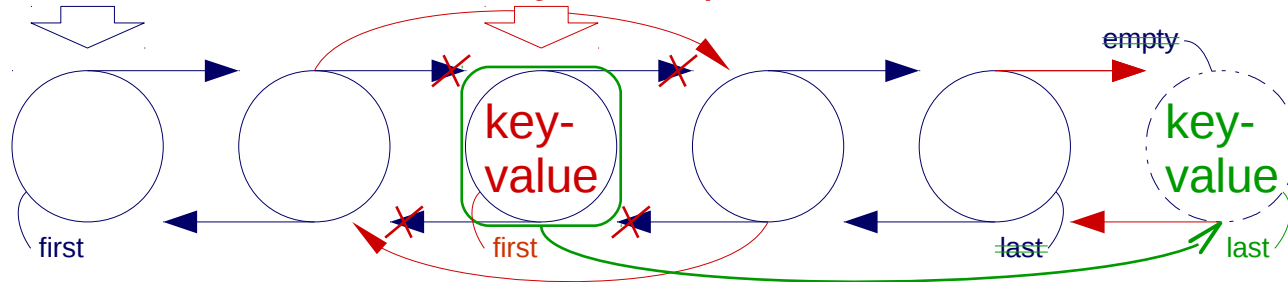
Next page is '**insertion case10 (hard)**'.

Ope. 0.

5 key-value pairs
are already inserted.

Ope. 2.

New insertion of a
key-value pair.

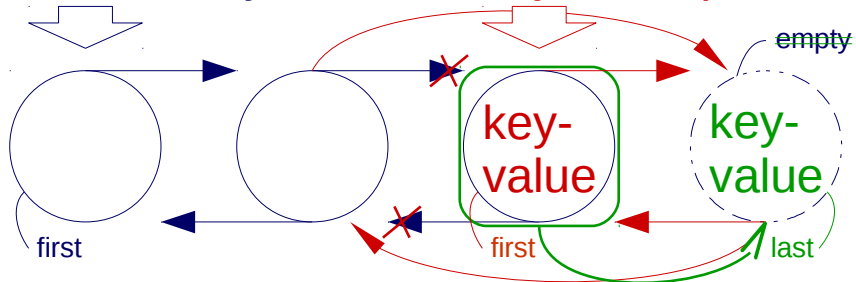


Ope. 1. Moving stored key-value pair.

Next page is '**insertion case11 (hard)**'.

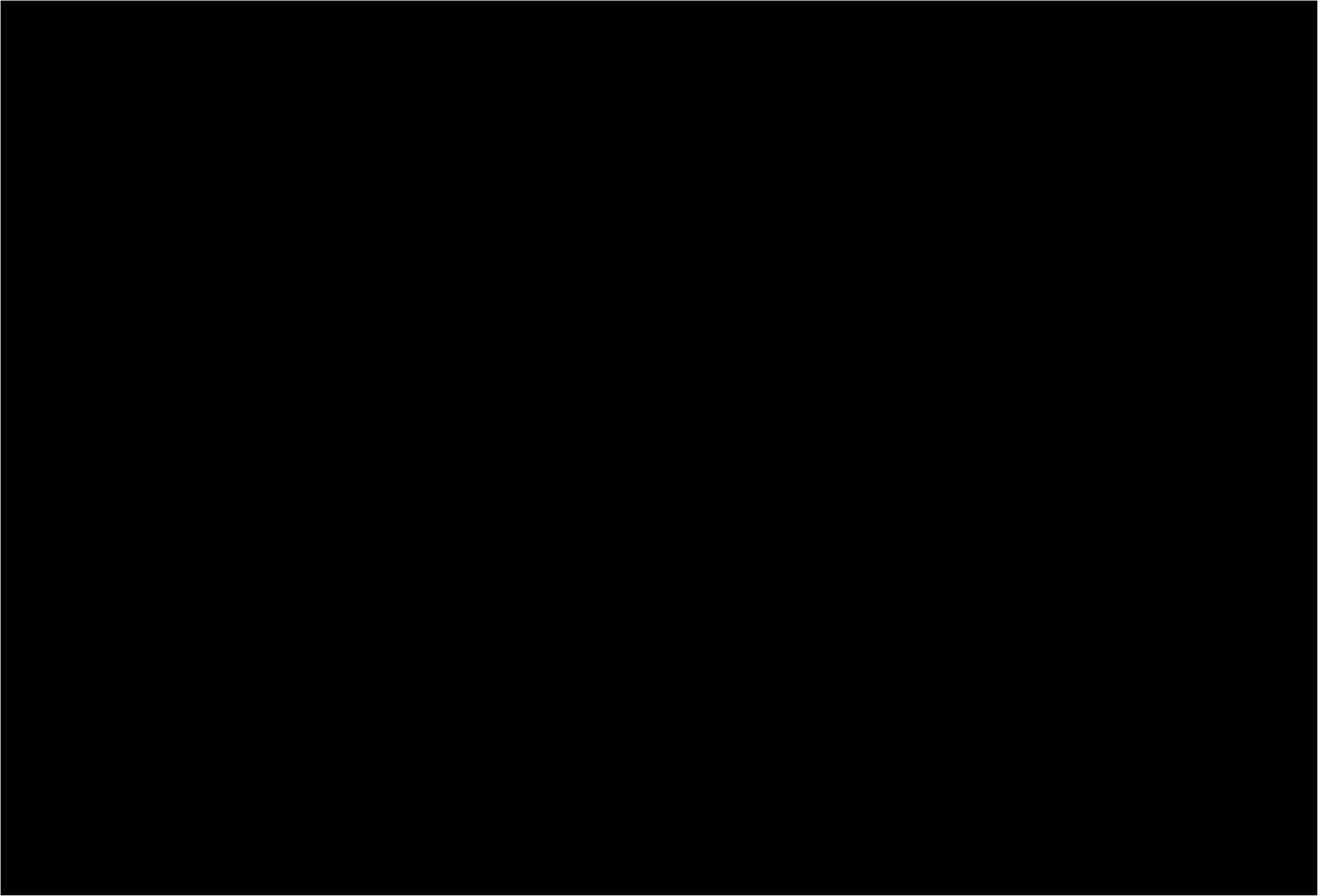
3 key-value pairs
are already inserted.

New insertion of a key-value pair.



Ope. 1. Moving stored key-value pair.

page for splitting.

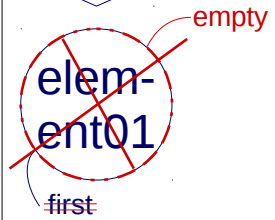
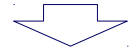


Next page is '**deletion case01**'.

Ope. 1. Deletion of element01.



Ope. 0. 1 key-value pair is already inserted.

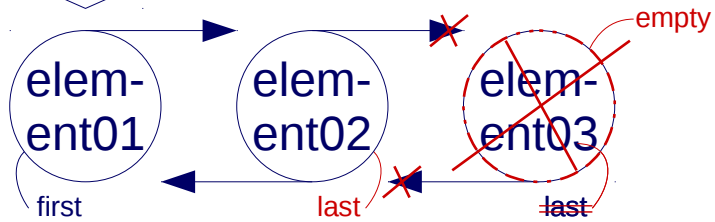


Next page is '**deletion case02**'.

Ope. 1. Deletion of element03.



Ope. 0. 3 key-value pairs are already inserted.

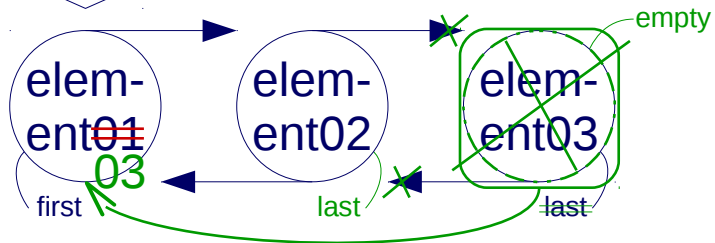


Next page is '**deletion case03**'.

Ope. 1. Deletion of element01.



Ope. 0. 3 key-value pairs are already inserted.



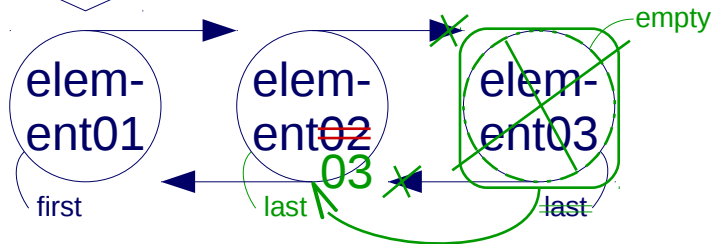
Ope. 2. Moving last element.

Next page is '**deletion case04**'.

Ope. 1. Deletion of element02.



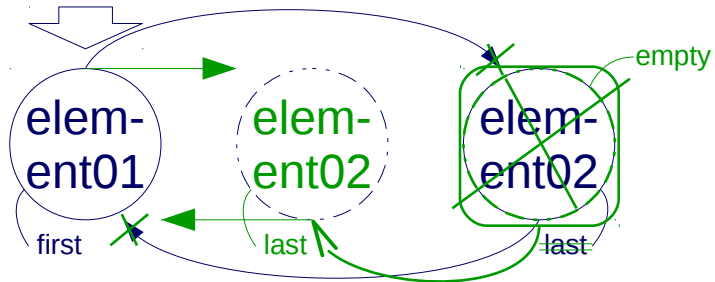
Ope. 0. 3 key-value pairs are already inserted.



Ope. 2. Moving last element.

Next page is '**deletion case05**'.

Ope. 0. 2 key-value pairs are already inserted.



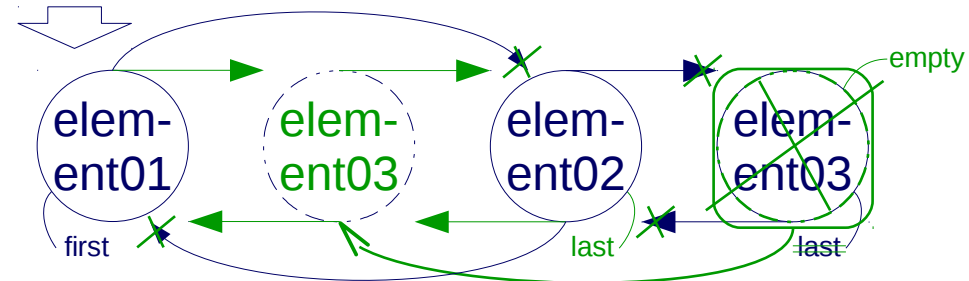
Ope. 1. Moving last element.

Next page is '**deletion case06**'.

Ope. 1. Deletion of element01.



Ope. 0. 3 key-value pairs are already inserted.



Ope. 2. Moving last element.