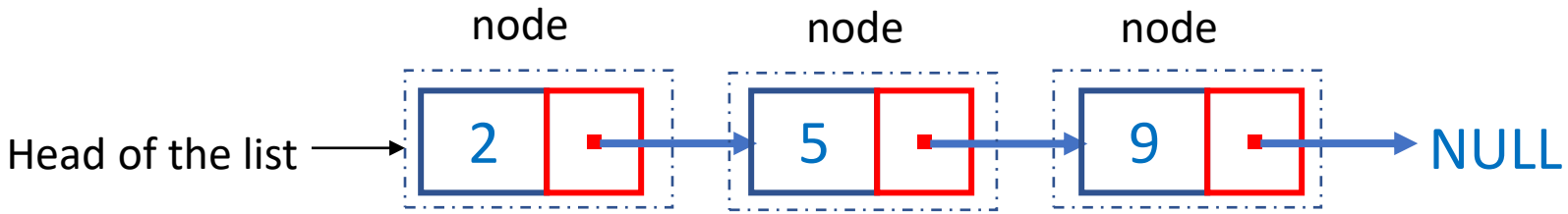
Linked List

A ‘linked list’ is a

- linear collection of data elements called ‘nodes’
- each node points to the next node in the list
- unlike arrays, linked list nodes are not stored at contiguous locations; they are linked using pointers as shown below.




```
typedef struct node{
        int data;
        struct node* next;
} node;
```

Example: Linked List Traversal

What do we perform:

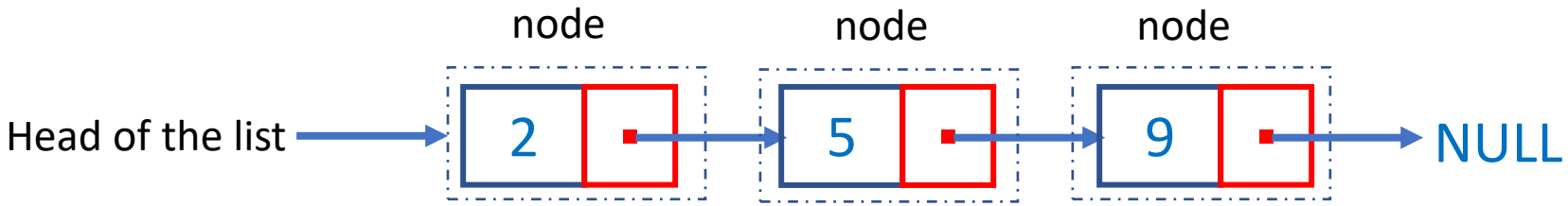
- For every node,

1. We read a value
2. Read a ‘pointer to the next’, update and compare

```
int print(list *l){

  node *current = l->head;

  while(current != NULL){
    printf("%d--> ", current->data);
    current = current->next;
  }
  printf("EndList\n");
  return 0;
}
```



```
#define MAXSIZE 4
typedef struct node{
   int number_of_elements;
   int data[MAXSIZE];
   struct node* next;
} node;
```

‘Unrolled’ Linked list with new node

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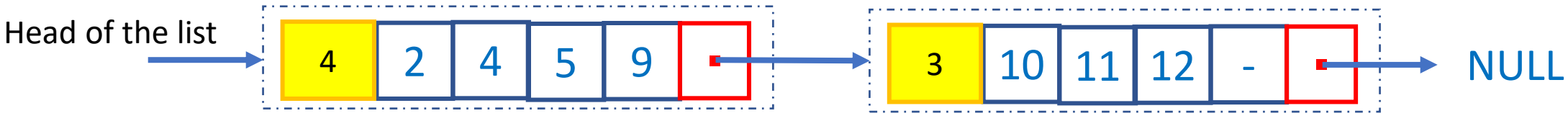

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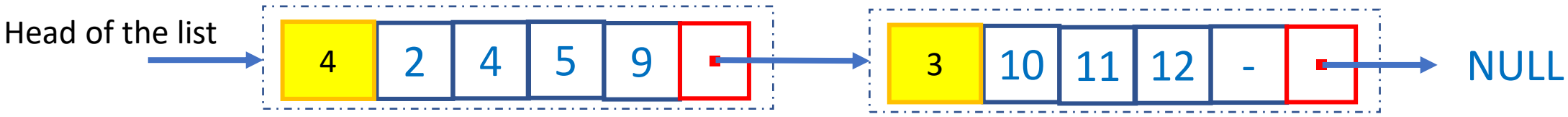
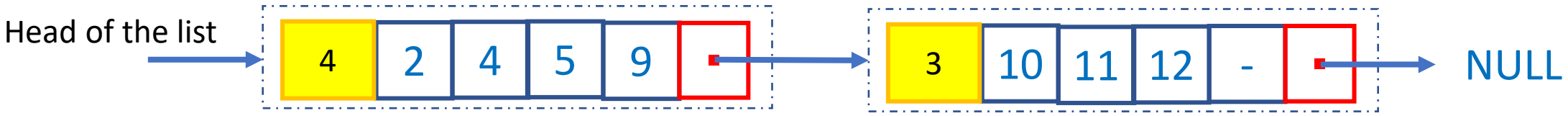


To traverse the list, for every node:

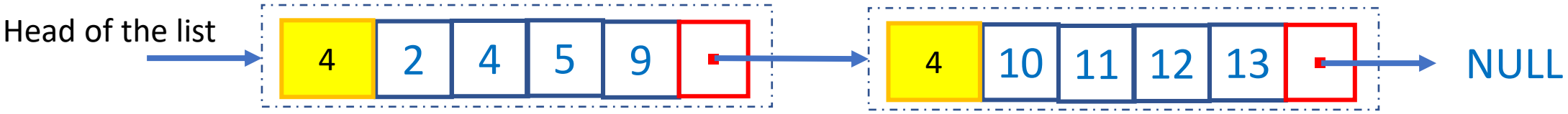
1. We read **multiple consecutive values**
2. Read a ‘pointer to the next’ and compare
3. Read an integer “number of elements”

Also cache-efficient. An entire node can reside in a cache-line

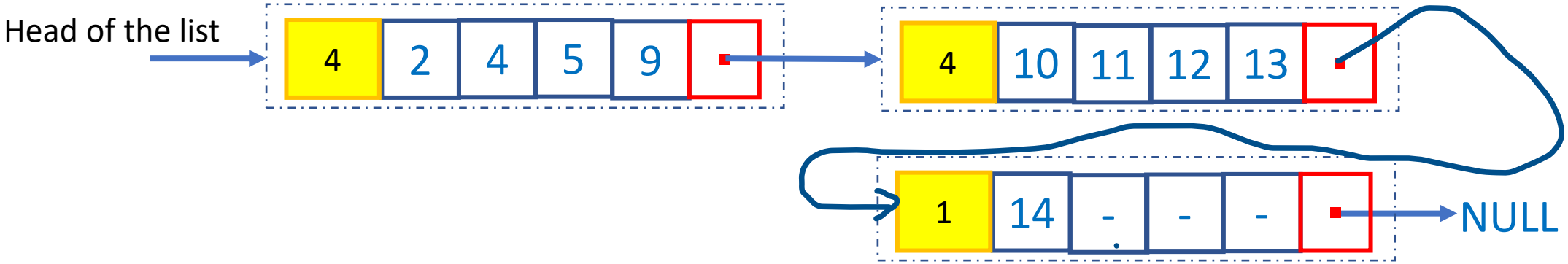
‘Unrolled’ Linked list: Appending a new value



Append(13);



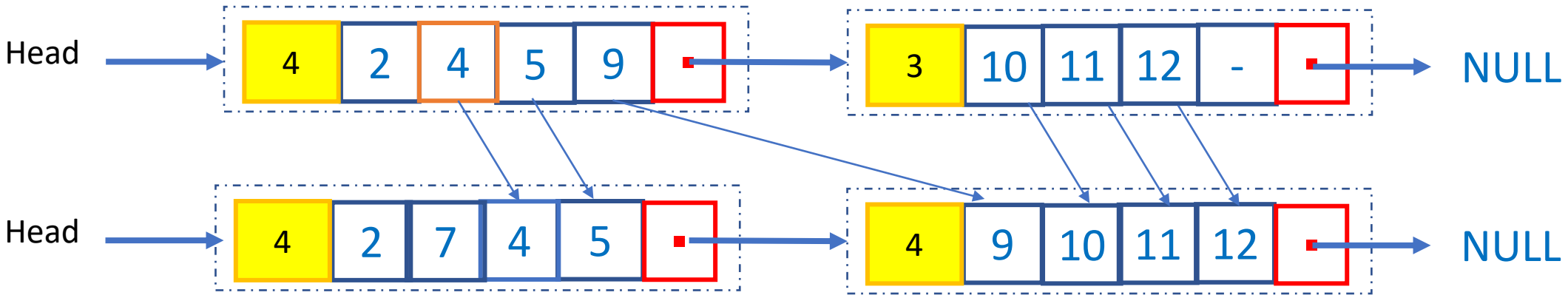
Append(14);



‘Unrolled’ Linked list: Inserting interior of list

Insert(i, x): Insert an element of value=x at the i-th position of the list.

Insert(1, 7);



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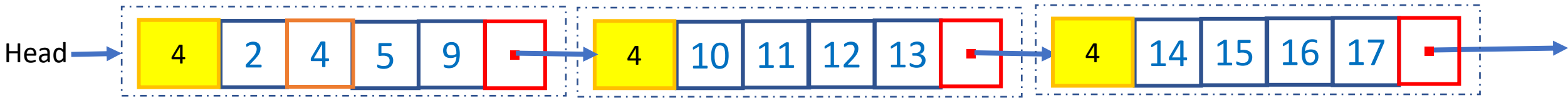
What if next several nodes do not have any empty space?



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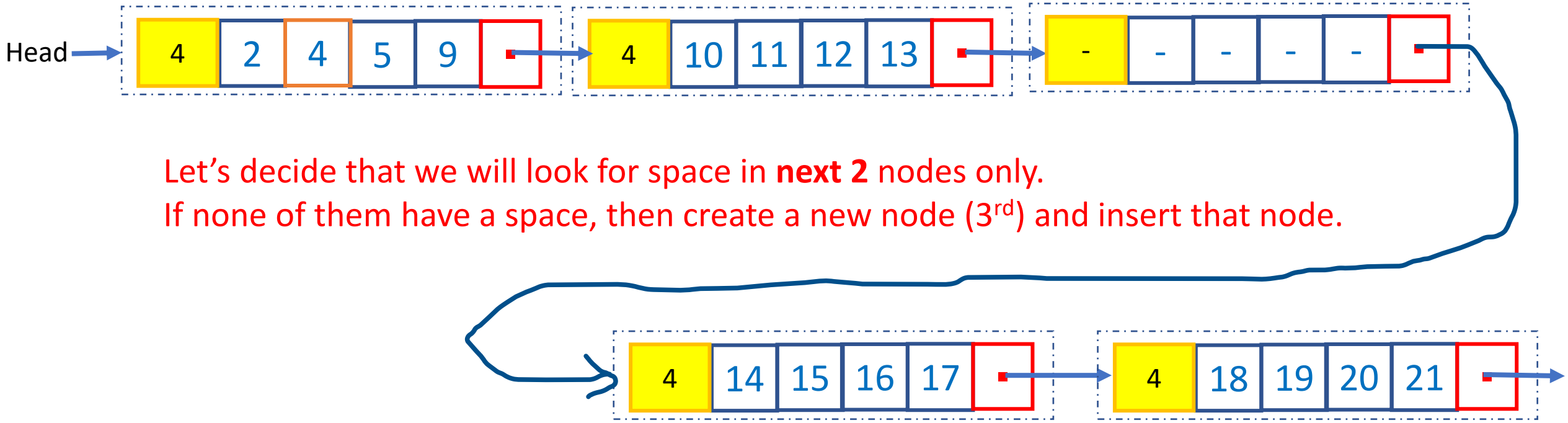
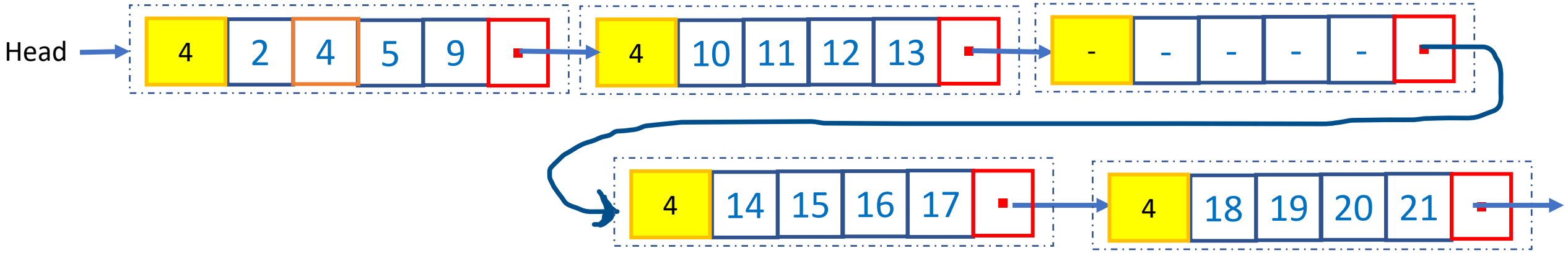


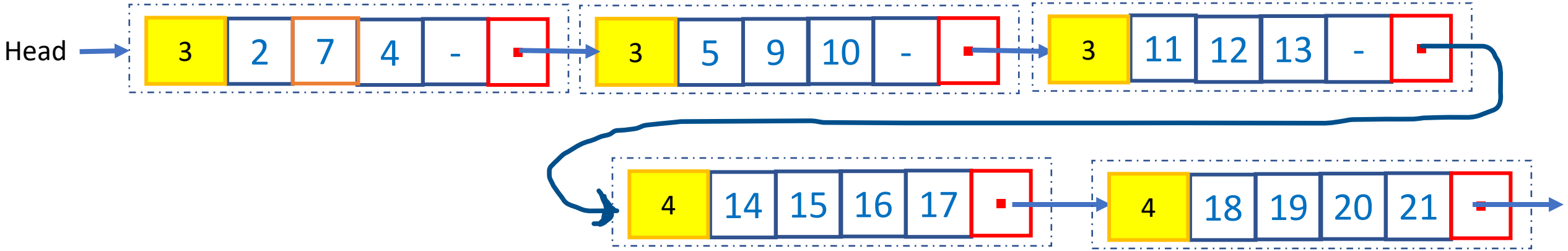
‘Unrolled’ Linked list: Inserting interior of list

Before:

Insert(1, 7);



Now:



Details analysis available at

http://opendatastructures.org/ods-java/3_3_SEList_Space_Efficient_.html