Institut Teknologi Telkom Purwokerto

Teknik Informatika - Fakultas Informatika

Pertemuan 5 – Linked List

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OUTLINE

- Linked List vs Array
- Single Linked List
- Double Linked List
- Circular Linked List

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Array vs Linked List

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Linked List

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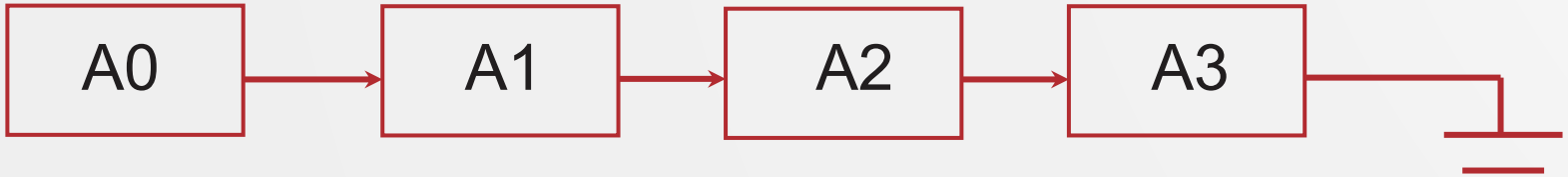

- **Menyimpan koleksi elemen secara non-contiguously.**
  - Elemen dapat terletak pada lokasi memory yang saling berjauhan. Bandingkan dengan array dimana tiap-tiap elemen akan terletak pada lokasi memory yang berurutan.
- **Mengizinkan operasi penambahan atau penghapusan elemen ditengah-tengah koleksi dengan hanya membutuhkan jumlah perpindahan elemen yang konstan.**
  - Bandingkan dengan array. Berapa banyak elemen yang harus dipindahkan bila akan menyisipi elemen ditengah- tengah array?

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- Sebuah list merupakan rantai dari object bertipe `ListNode` yang berisikan data dan referensi (pointer) kepada `ListNode` selanjutnya dalam list.
- Harus diketahui dimana letak elemen pertama!

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Linked List

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- Array
  - Statis
  - Terbatas dalam menambah/menghapus data
  - Random Access
  - Penghapusan data tidak mungkin
- Linked List
  - Dinamis
  - Tidak terbatas dalam menambah/menghapus
  - Sequential Access
  - Penghapusan data mudah

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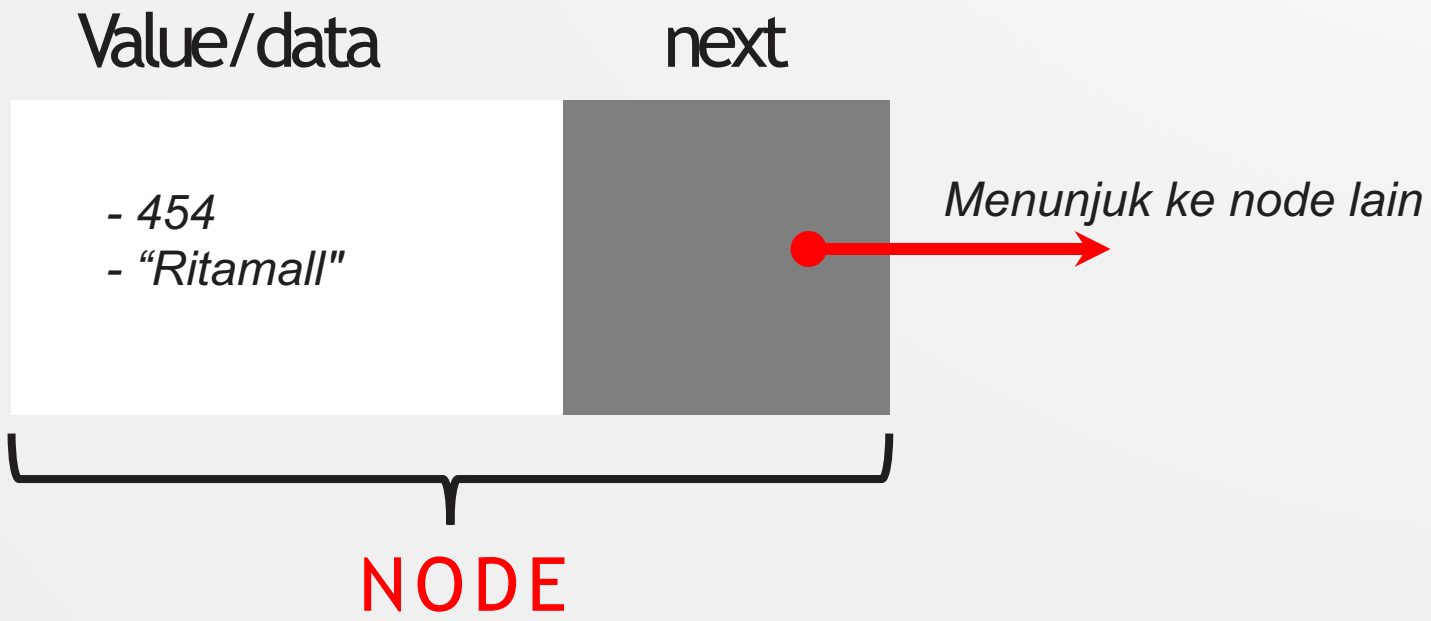
- Yang disimpan dalam **`ListNode`** adalah reference dari object-nya, BUKAN object-nya itu sendiri atau salinan dari object-nya !!!

```
struct namaTeman
{
    string nama;
    namaTeman *next;
}
```



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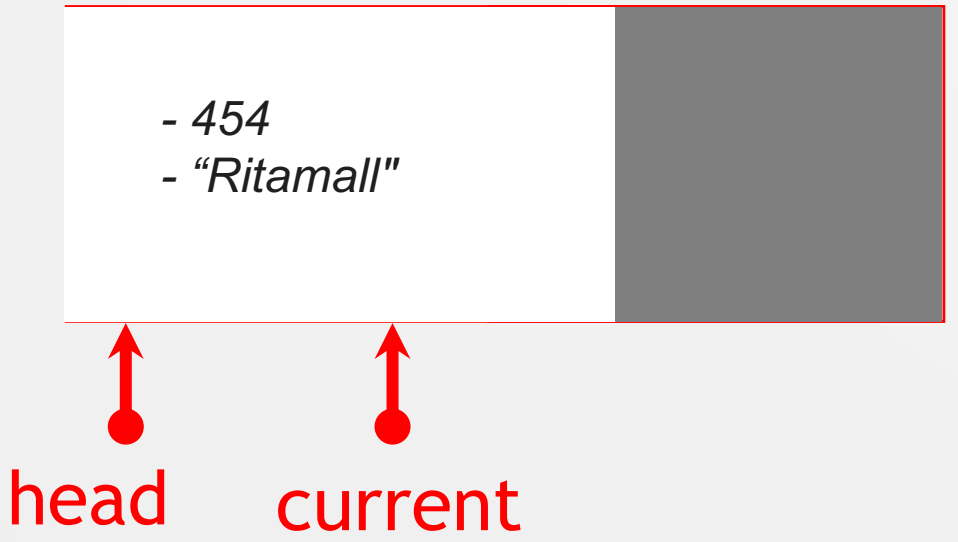
```
struct namaTeman
{
    string nama;
    namaTeman *next;
} *head

head = new namaTeman;
current = head;
```



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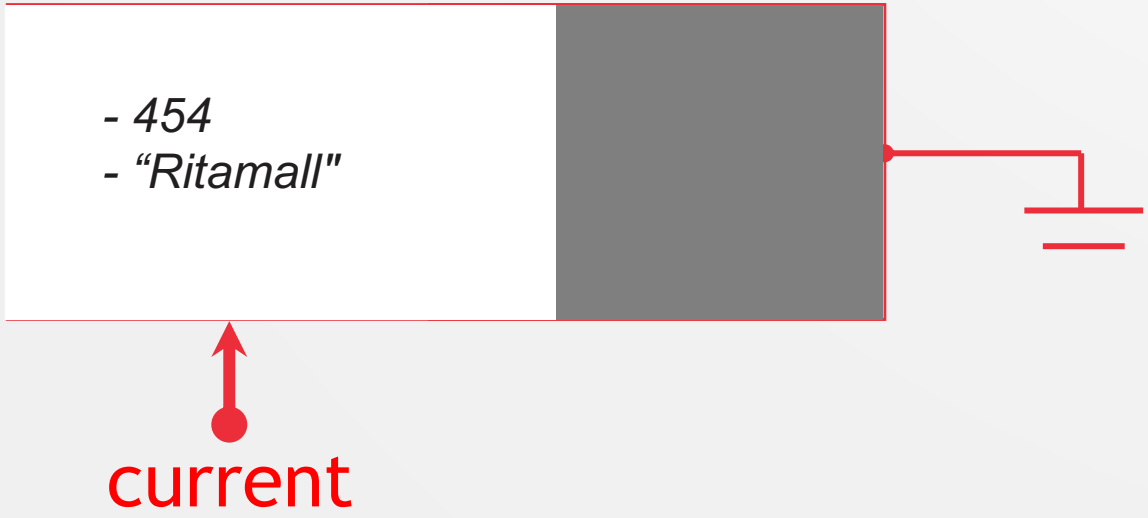
```
current->next = NULL;
```



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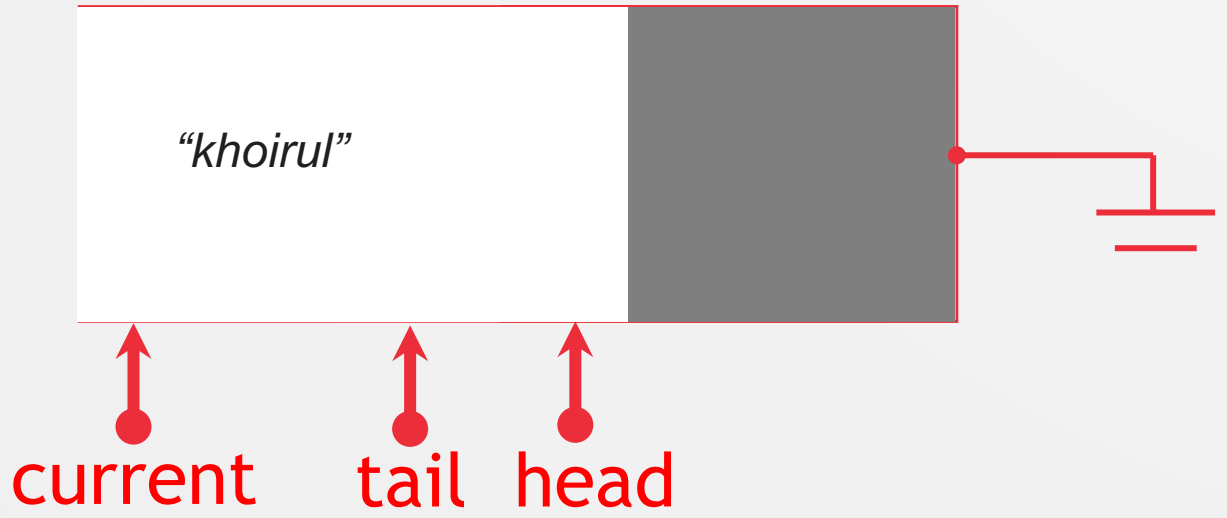
```
current = new namaTeman;
current->nama = "khoirul";
tail = current;
head = current;
tail->next=NULL;
```



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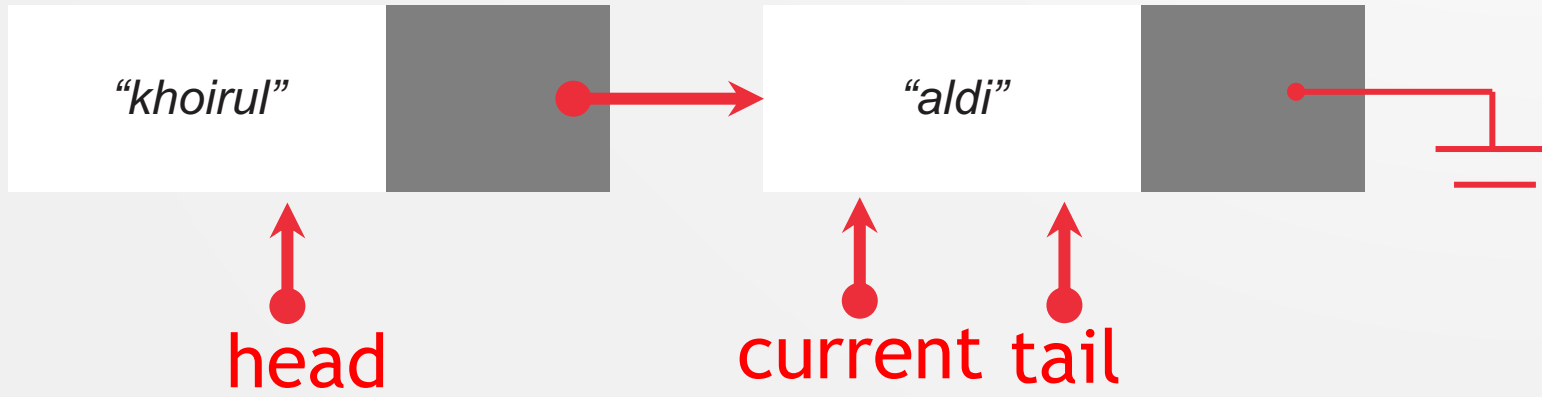
```
current = new namaTeman;
current->nama = "khoirul";
tail = current;
head = current;
tail->next=NULL;

current = new namaTeman;
current->nama = "aldi";
tail->next = current;
tail = tail->next;
tail->next=NULL;
```



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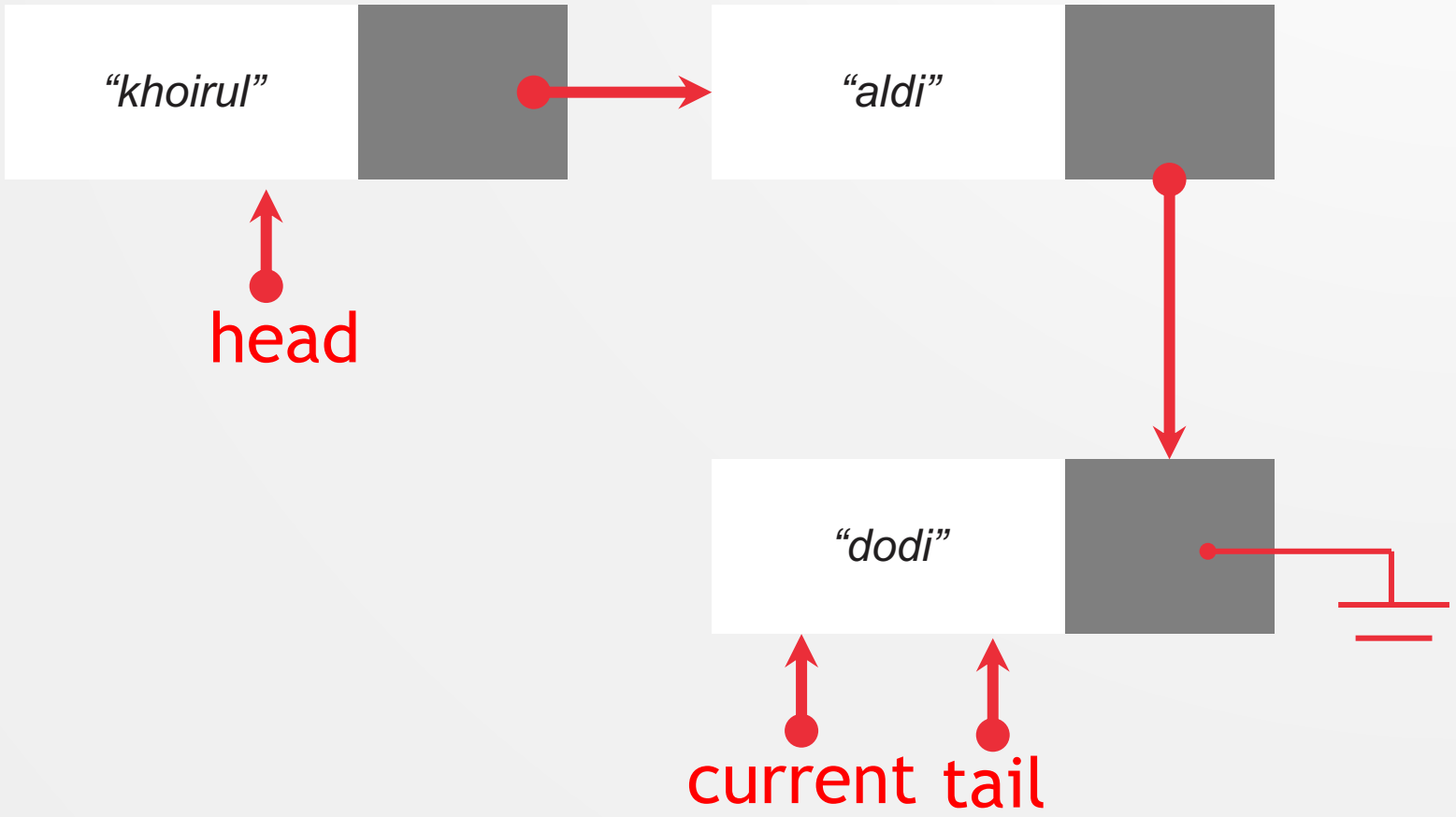
```
current = new namaTeman;
current->nama = "khoirul";
tail = current;
head = current;
tail->next=NULL;

current = new namaTeman;
current->nama = "aldi";
tail->next = current;
tail = tail->next;
tail->next=NULL;

current = new namaTeman;
current->nama = "dodi";
tail->next = current;
tail = tail->next;
tail->next=NULL;
```



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Single Linked List

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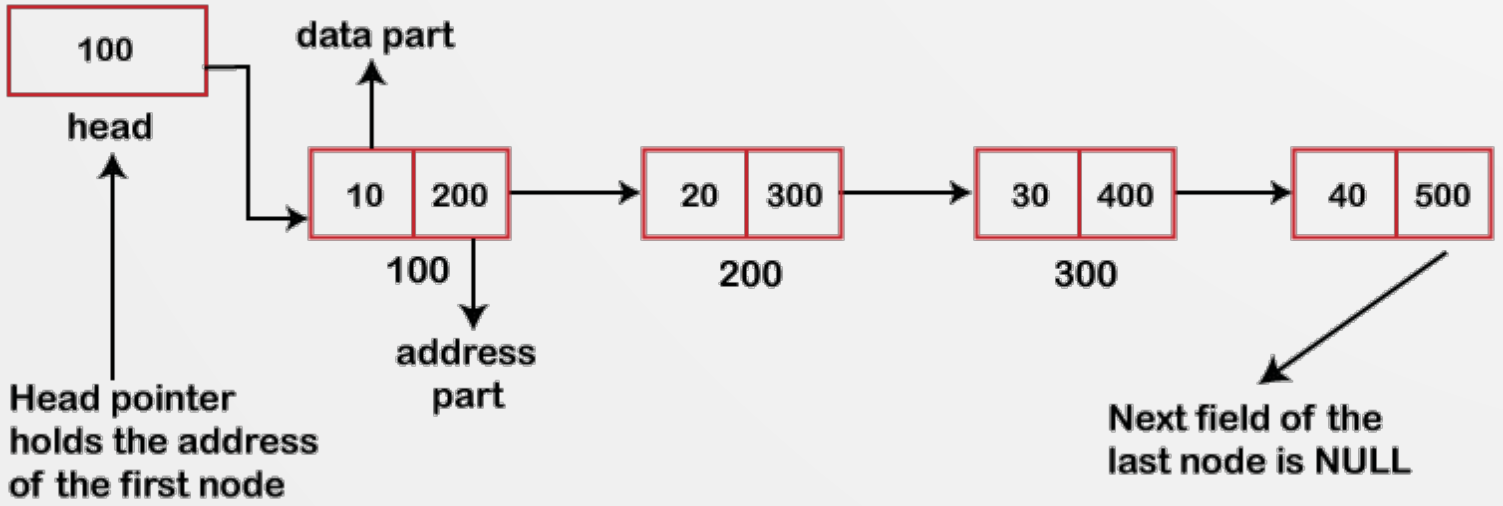
- *Single linked list* atau linked list
- Tiap elemen terdiri dari dua bagian, yaitu sebuah data dan sebuah pointer/link yang disebut dengan link *next*.



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Double Linked List

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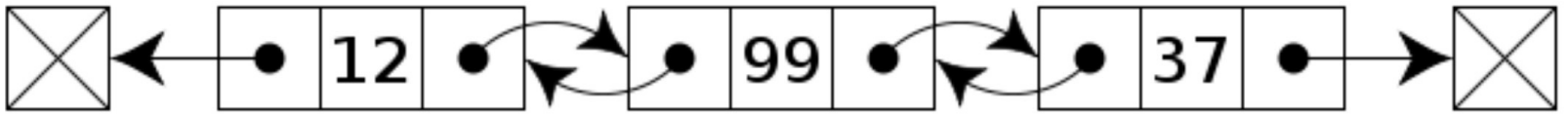
- Struktur data atas tiap-tiap node memiliki rujukan pada node sebelum dan berikutnya. Sebagian algoritma membutuhkan taut ganda, contohnya sorting dan reverse traversing.



Senarai ganda dengan tiap-tiap node yang terdiri atas tiga elemen, data integer, dan dua elemen rujukan ke node sebelum serta berikutnya

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Circular Linked List

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- Pada dua jenis senarai sebelumnya, node terakhir dalam senarai tersebut merujuk pada null yang artinya akhir dari sebuah senarai, begitu pula null sebagai rujukan node sebelumnya pada node pertama bila senarai yang dimaksudkan adalah senarai ganda.

- Pada senarai sirkular, informasi rujukan pada node terakhir akan merujuk pada node pertama, dan rujukan pada node pertama akan merujuk pada node terakhir bila yang digunakan sebagai dasar implementasi adalah senarai ganda.

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Senarai sirkular dengan menggunakan model implementasi senarai tungal. Node terakhir menyimpan rujukan pada node pertama

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Single Linked List

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Single Linked List

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- **INSERT**
  - insert sebagai node awal (head) dari linked list
  - insert sebagai node akhir (tail) dari linked list
  - insert setelah node tertentu
  - insert sebelum node tertentu

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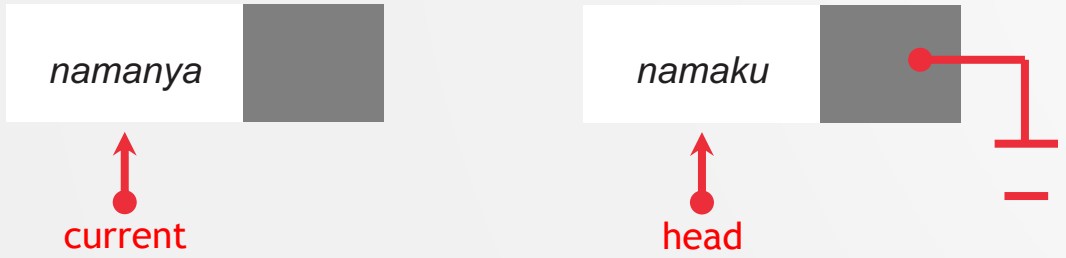
Single Linked List

insert sebagai node **awal (head)** dari linked list




```
void tambahDiDepan(string namanya)
{
    current = new namaTeman;
    current->nama = namanya;
    current->next = head;
    head = current;
}
```

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Single Linked List

insert sebagai node **akhir (tail)** dari linked list

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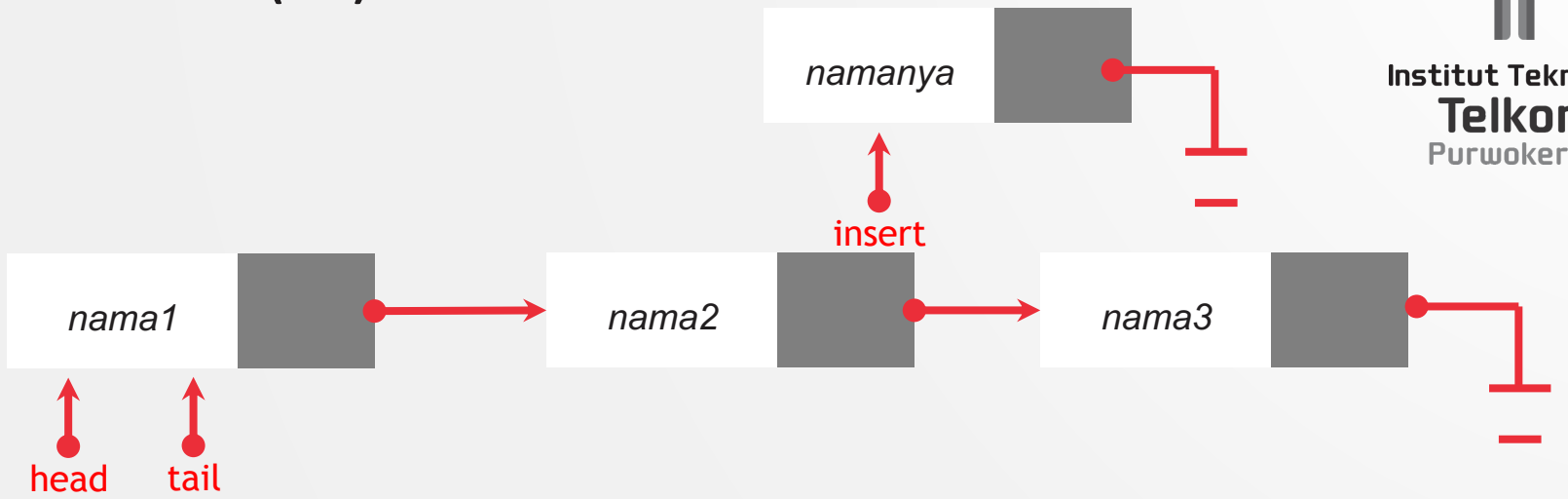
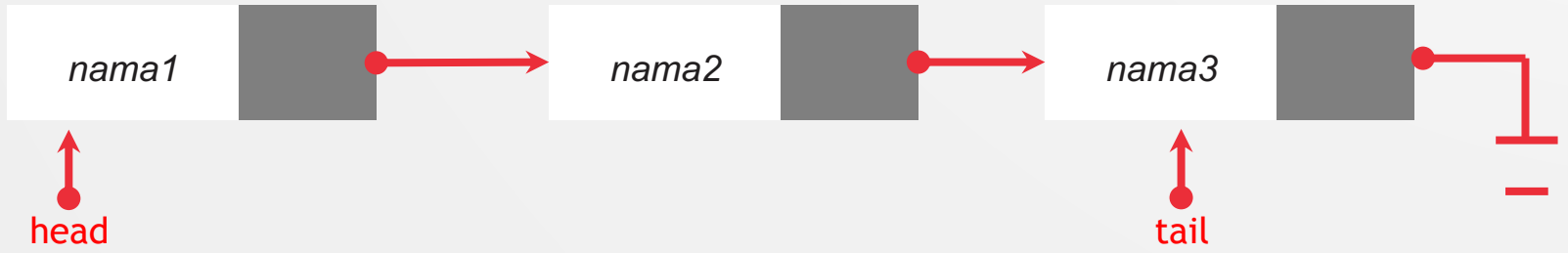
```
void tambahDiBelakang(string namanya)
{
    insert = new namaTeman();
    insert->nama = namanya;
    insert->next = NULL;
    tail = head;
    do
        tail = tail->next;
    while (tail->next != NULL);
    tail->next = insert;
    tail = tail->next;
    tail->next = NULL;
}
```





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Single Linked List

insert sebagai node **akhir (tail)** dari linked list

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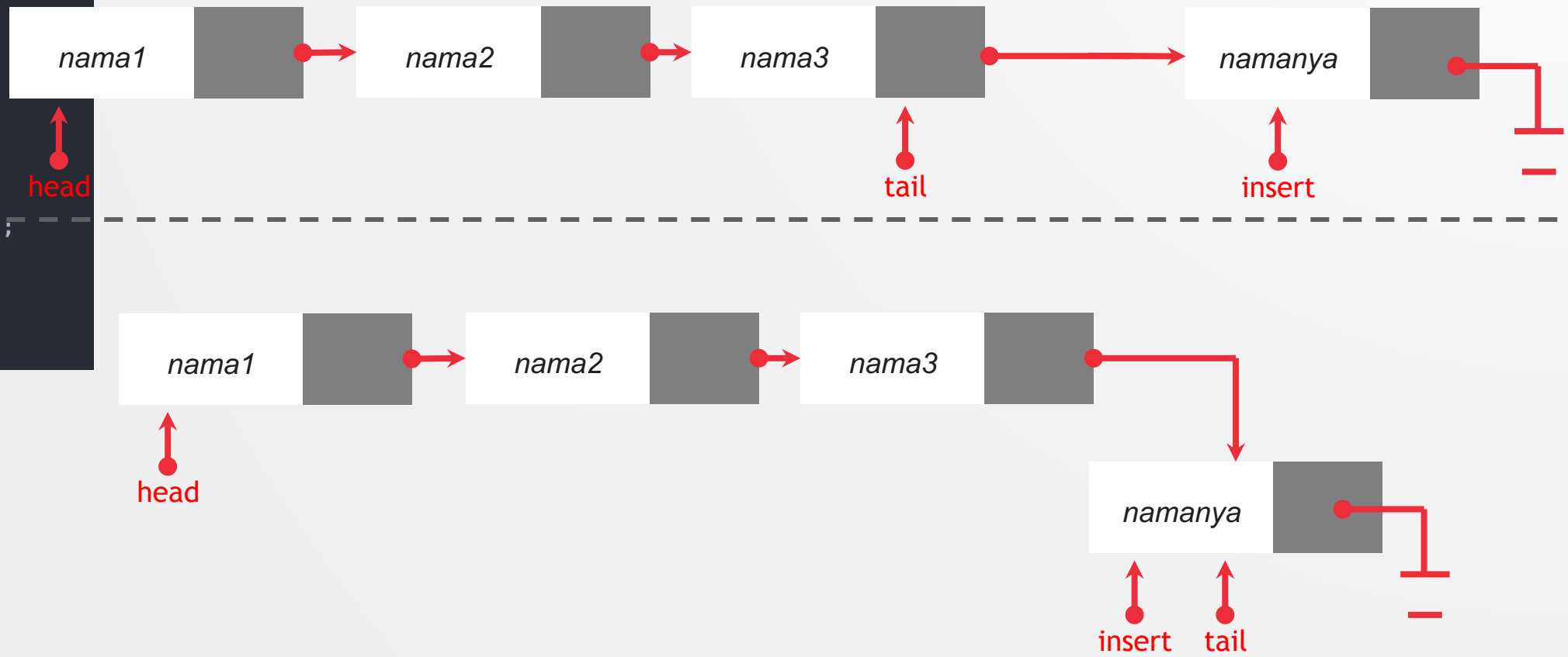
```
void tambahDiBelakang(string namanya)
{
    insert = new namaTeman();
    insert->nama = namanya;
    insert->next = NULL;
    tail = head;
    do
        tail = tail->next;
    while (tail->next != NULL);
    tail->next = insert;
    tail = tail->next;
    tail->next = NULL;
}
```



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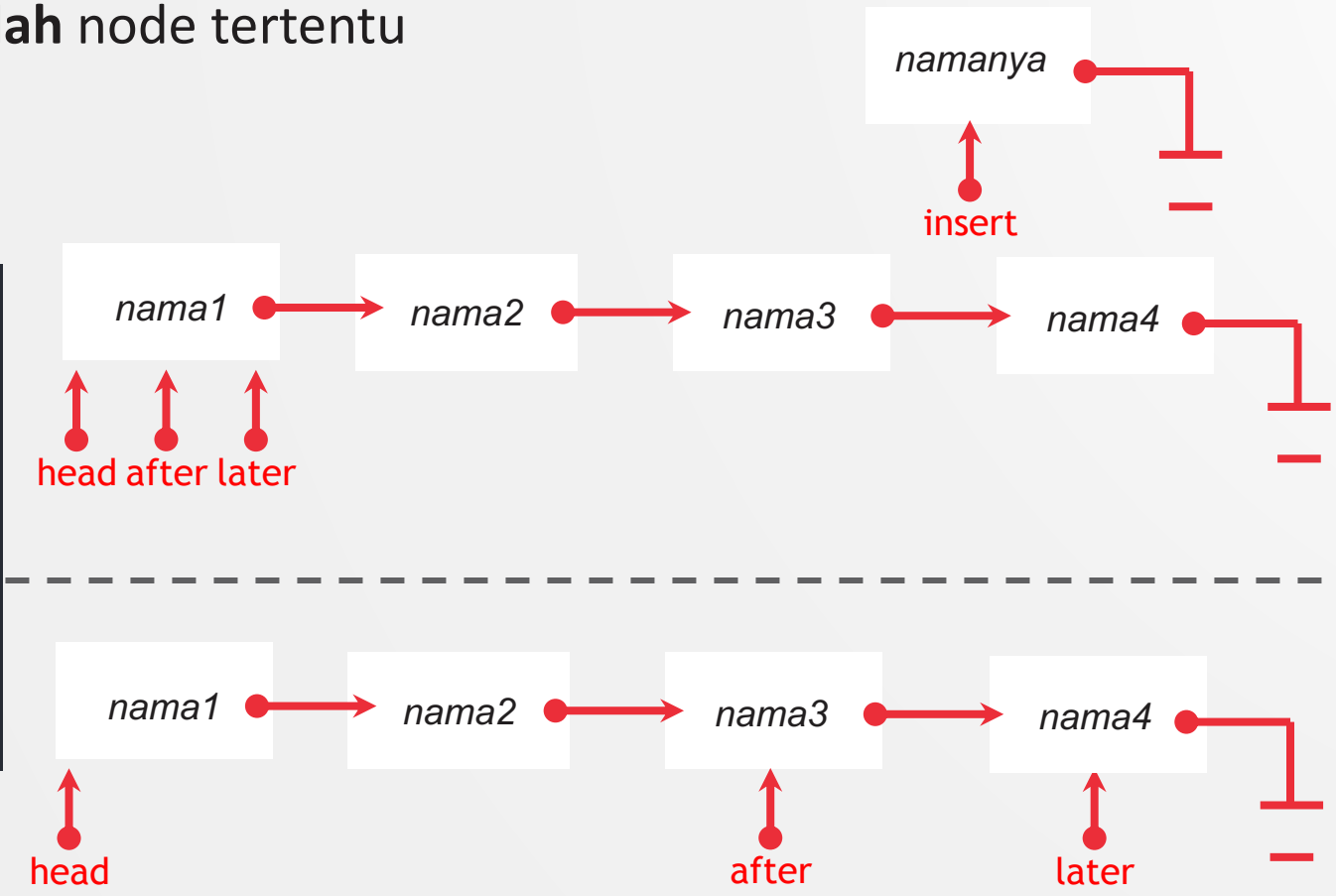
Single Linked List

insert **setelah** node tertentu

```
void tambahSetelah(string yangDicari, string namanya)
{
    insert = new namaTeman();
    insert->nama = namanya;
    after = head;
    later = head;
    do
    {
        after = later;
        later = later->next;
    } while (after->nama != yangDicari);
    after->next = insert;
    insert->next = later;
}
```

Misal, setelah "nama3"



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insert **setelah** node tertentu

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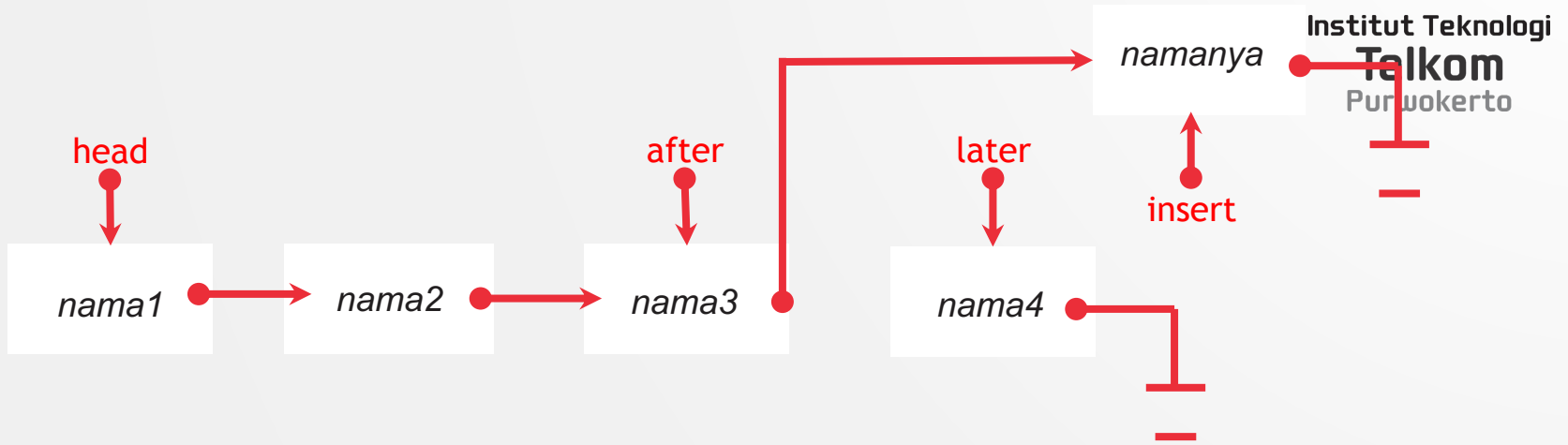
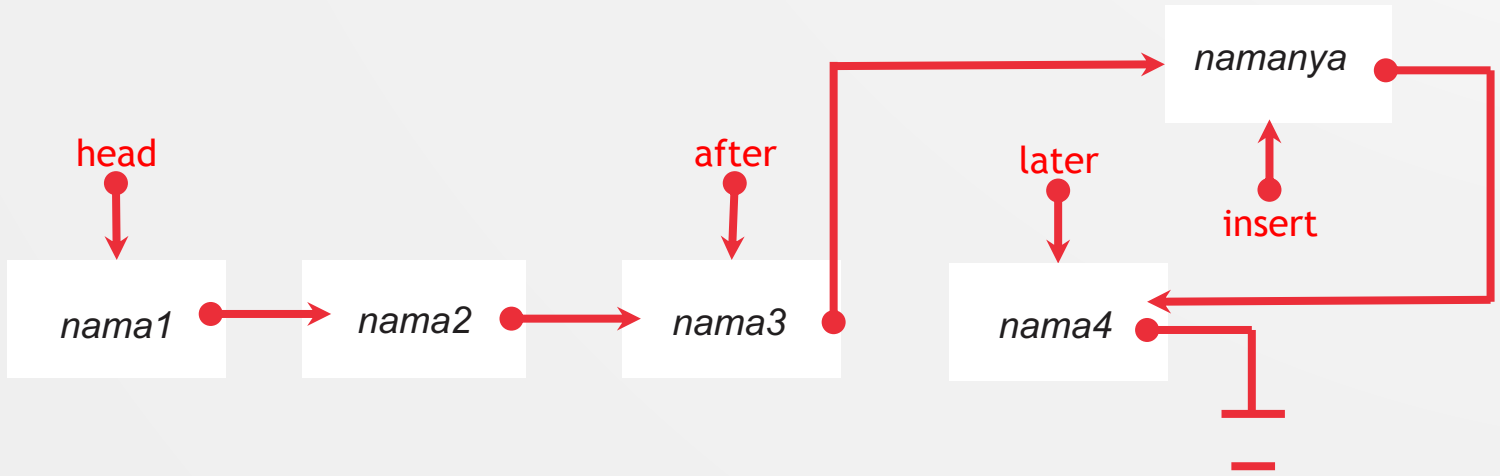
```
void tambahSetelah(string yangDicari, string namanya)
{
    insert = new namaTeman();
    insert->nama = namanya;
    after = head;
    later = head;
    do
    {
        after = later;
        later = later->next;
    } while (after->nama != yangDicari);
    after->next = insert;
    insert->next = later;
}
```

Misal, setelah "nama3"





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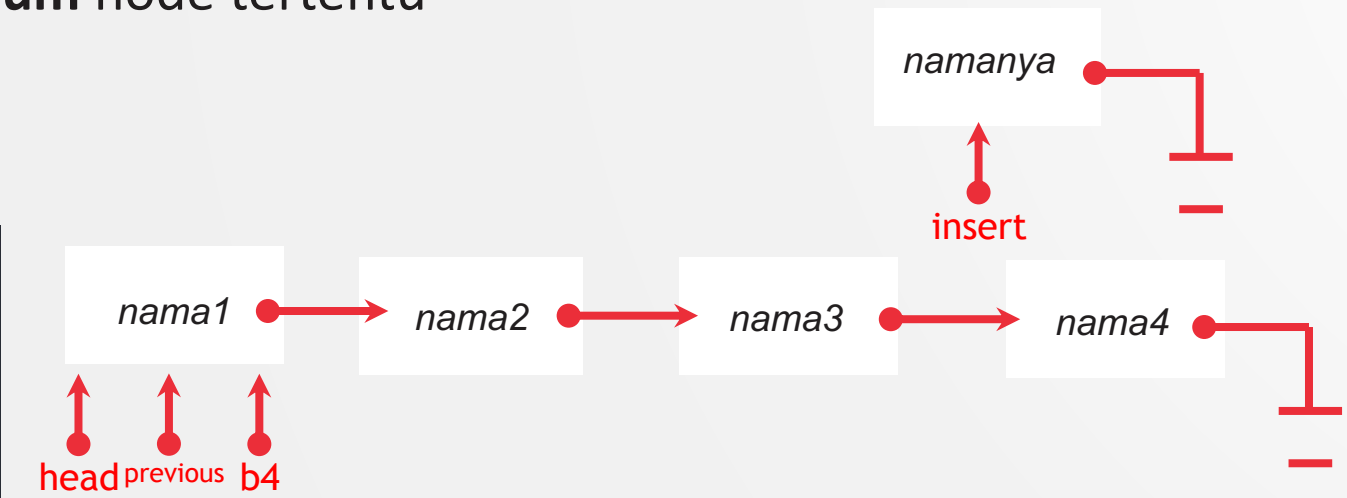
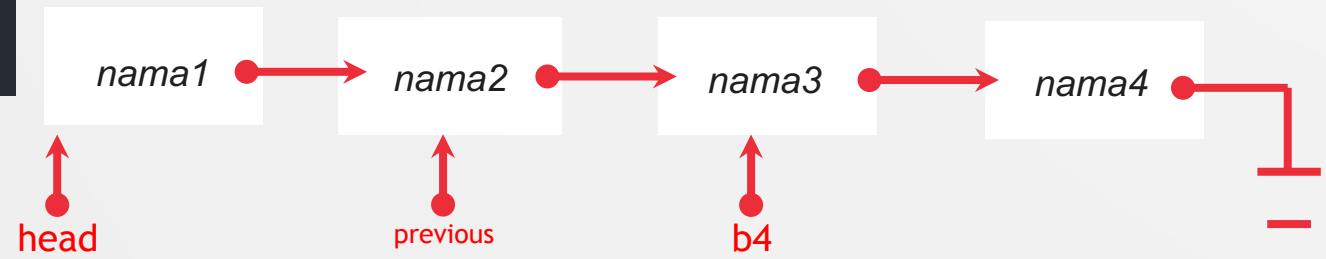
Single Linked List

insert **sebelum** node tertentu

```
void tambahSebelum(string yangDicari, string namanya)
{
    insert = new namaTeman();
    insert->nama = namanya;
    previous = head;
    b4 = head;
    do
    {
        previous = b4;
        b4 = b4->next;
    } while (b4->nama != yangDicari);
    previous->next = insert;
    insert->next = b4;
}
```

Misal, sebelum "nama3"





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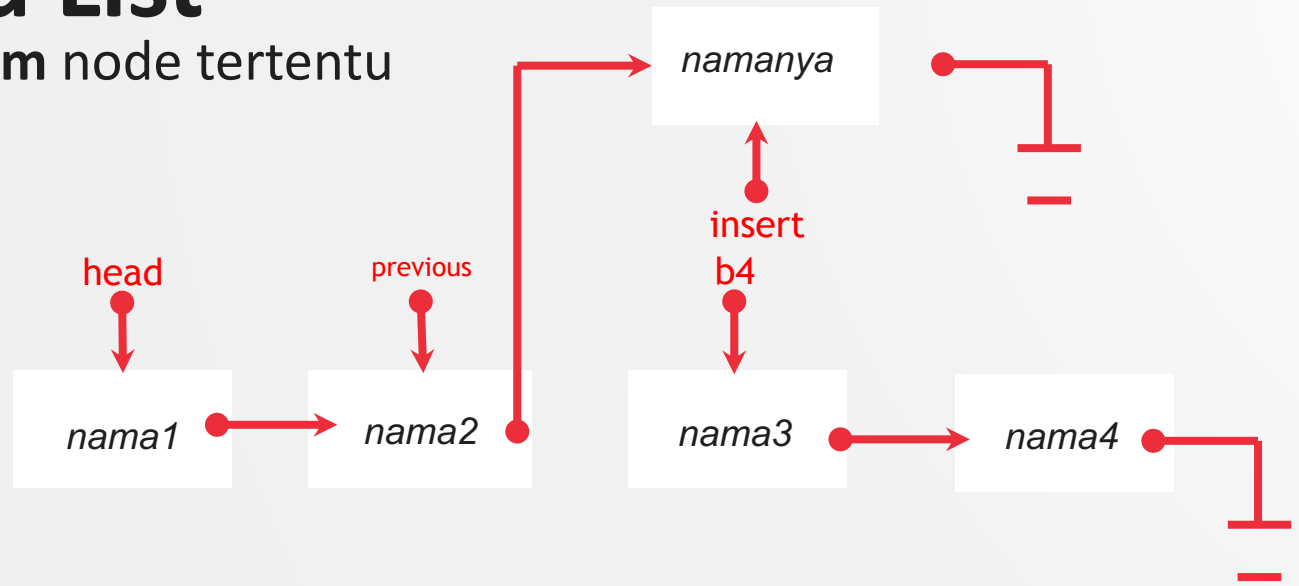
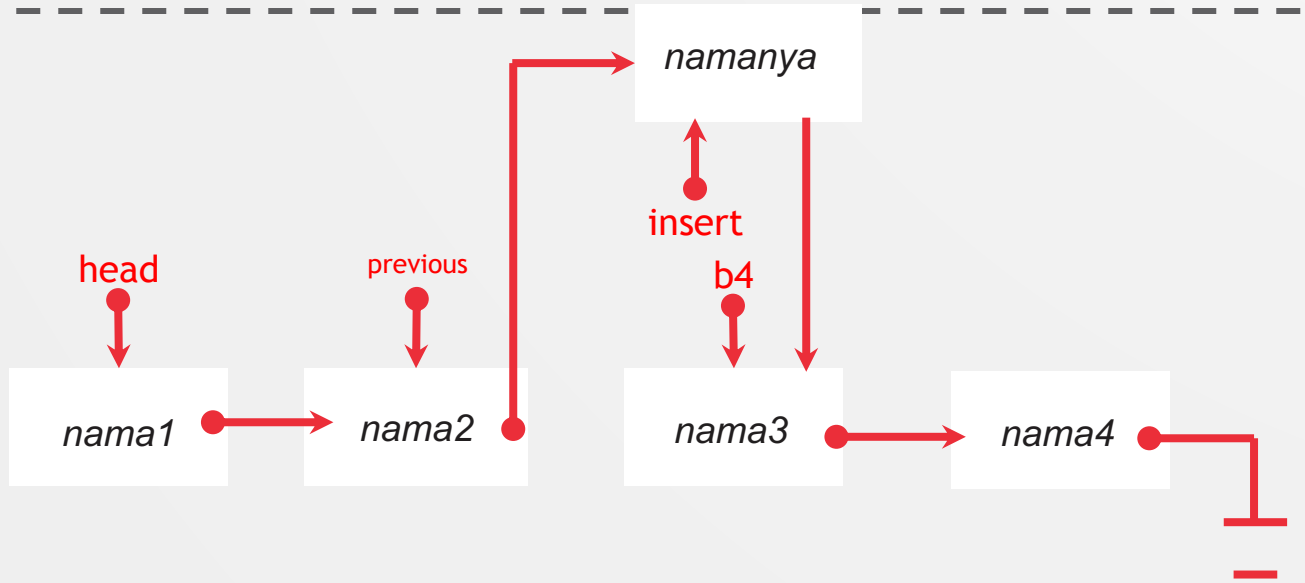
Single Linked List

insert **sebelum** node tertentu

```
void tambahSebelum(string yangDicari, string namanya)
{
    insert = new namaTeman();
    insert->nama = namanya;
    previous = head;
    b4 = head;
    do
    {
        previous = b4;
        b4 = b4->next;
    } while (b4->nama != yangDicari);
    previous->next = insert;
    insert->next = b4;
}
```

Misal, sebelum "nama3"





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Single Linked List

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- **DELETE**
  - delete sebagai simpul pertama(head) dari linked list
  - delete simpul terakhir
  - delete setelah simpul tertentu

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Single Linked List

delete sebagai **simpul pertama(head)** dari linked list

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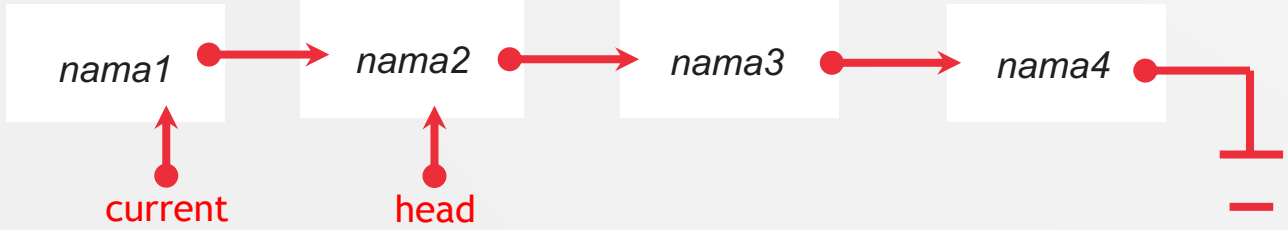
```
void hapusAwal()
{
    current = head;
    head = current->next;
}
```



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Single Linked List

delete sebagai **simpul akhir (tail)** dari linked list

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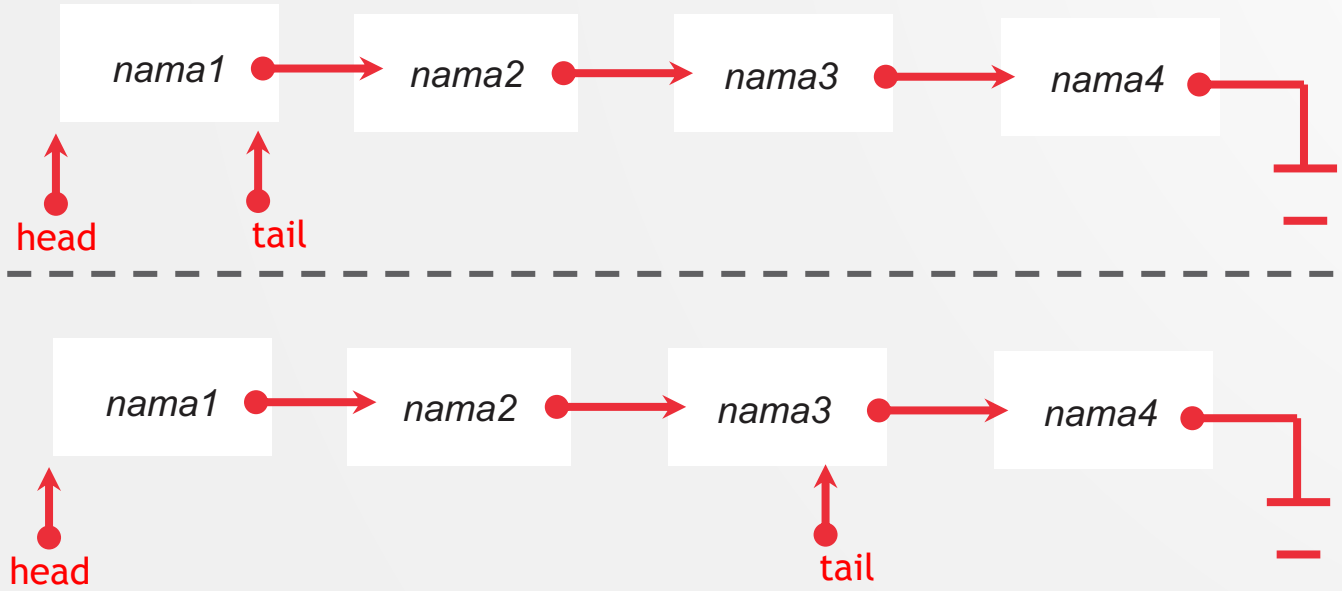
```
void hapusAkhir2()
{
    tail = head;
    while (tail->next->next != NULL)
        tail = tail->next;
    tail->next = NULL;
}
```



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Single Linked List

delete **simpul tertentu**

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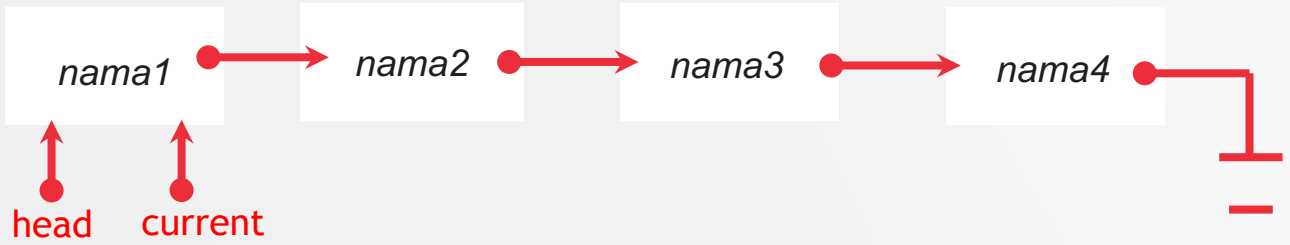
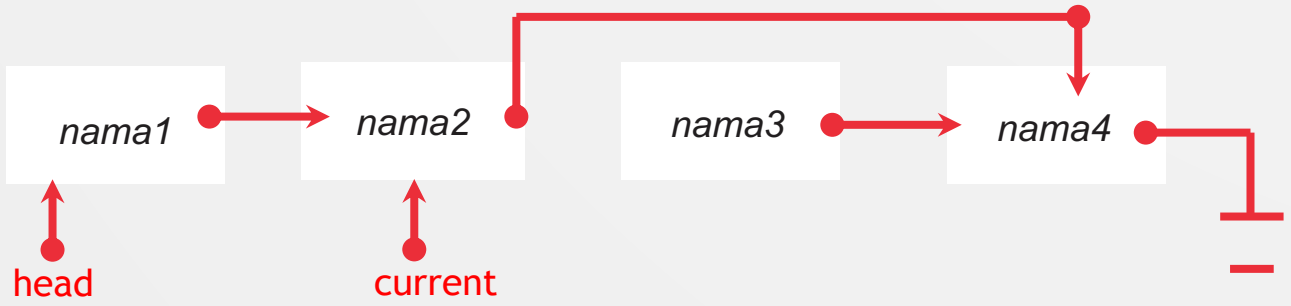



```
void hapusTertentu(string yangDicari)
{
    current = head;
    while (current->next->nama != yangDicari)
    {
        current = current->next;
    }
    current->next = current->next->next;
}
```

Misal, menghapus "nama3"



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