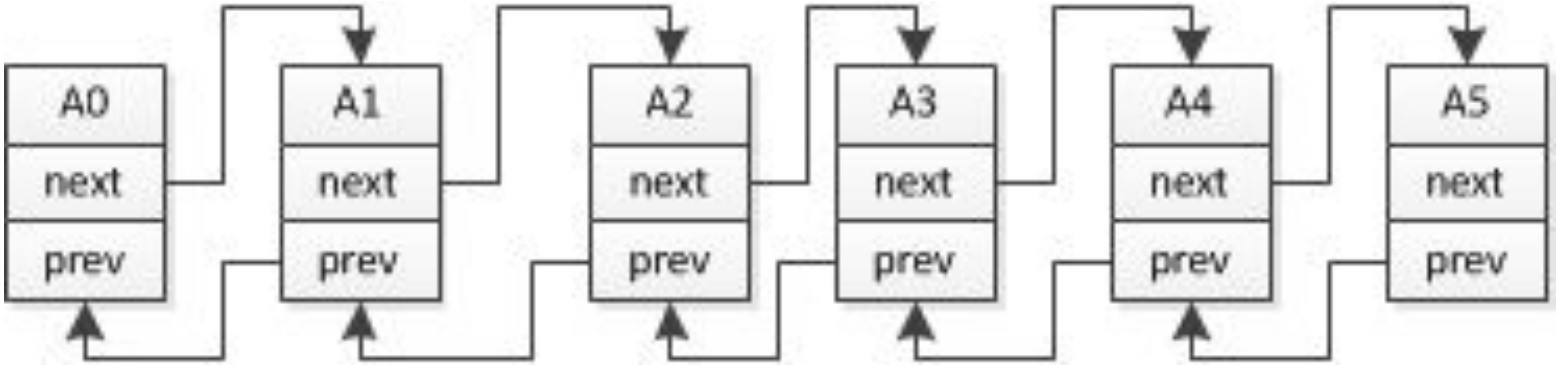
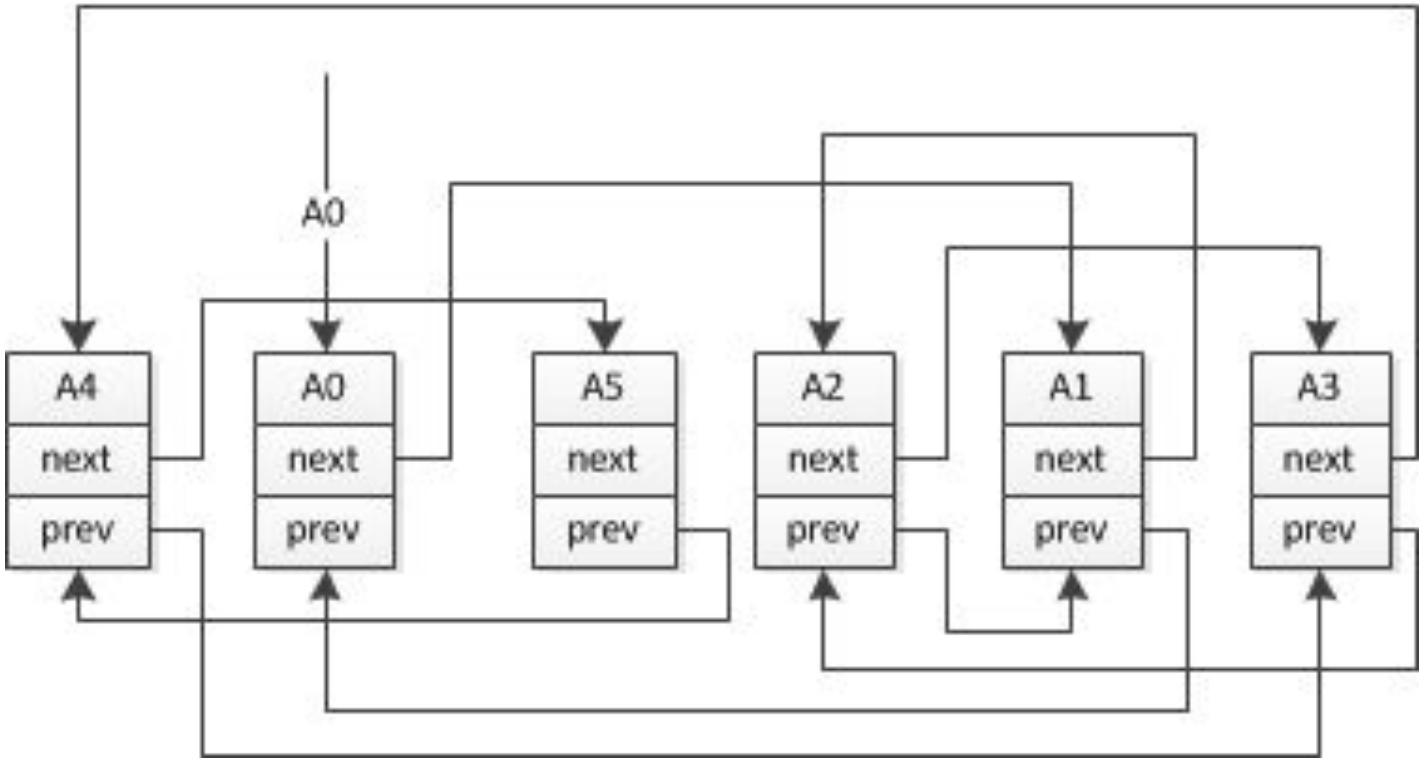
Двусвязные списки

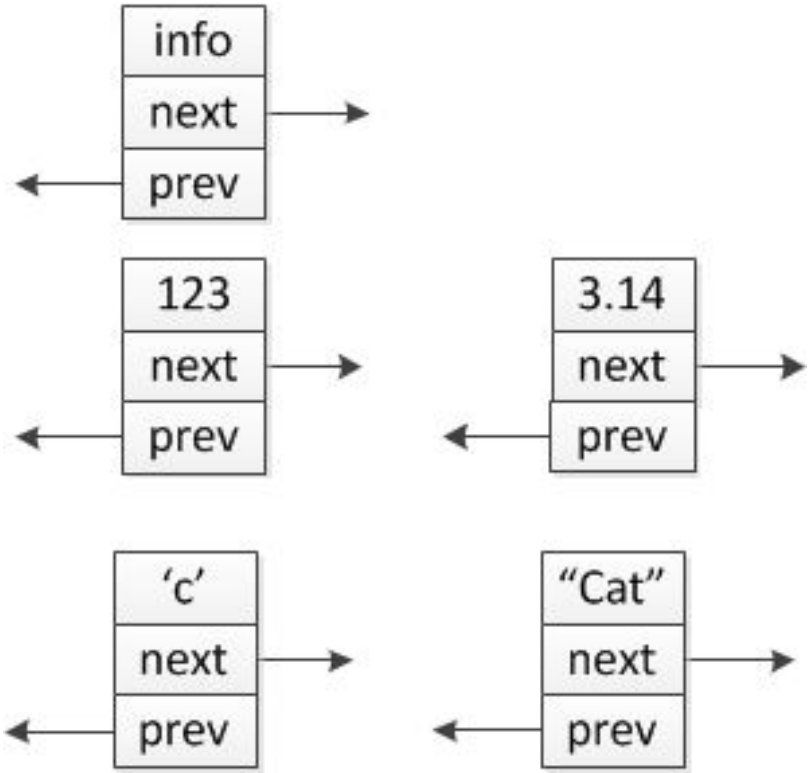
Идея списка


A0
next
prev
A1
next
prev
A2
next
prev
A3
next
prev
A4
next
prev
A5
next
prev

Идея списка


A0
A4
next
prev
A0
next
prev
A5
next
prev
A2
next
prev
A1
next
prev
A3
next
prev

Узел списка и его содержимое



Узел списка (код)

```
struct node{
    int info;
    node* next;
    node* prev;
};
```

Список руками

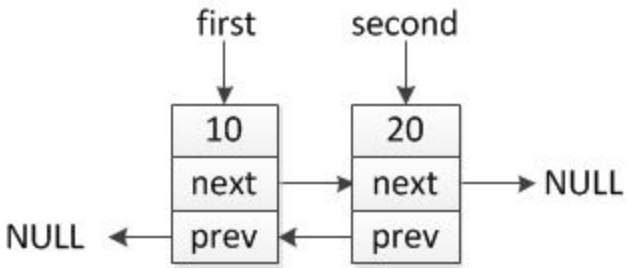
```
struct node{
    int info;
    node *next;
    node *prev;
};
int main() {
    node *first, * second;
    first = new node;
    first->info = 10;
    second = new node;
    second->info = 20;
```

```
first->next = second;
second->next = NULL;
first->prev = NULL;
second->prev = first;

cout << first->info << endl;
cout << second->info << endl;
cout << first->next->info << endl;
cout << second->next->info << endl;
cout << first->prev->info << endl;
cout << second->prev->info << endl;
}
```

Список руками

```
struct node{
    int info;
    node *next;
    node *prev;
};
int main() {
    node *first, * second;
    first = new node;
    first->info = 10;
    second = new node;
    second->info = 20;
```

```
first->next = second;
second->next = NULL;
first->prev = NULL;
second->prev = first;

cout << first->info << endl;
cout << second->info << endl;
cout << first->next->info << endl;
cout << second->next->info << endl;
cout << first->prev->info << endl;
cout << second->prev->info << endl;
}
```



Список руками 2

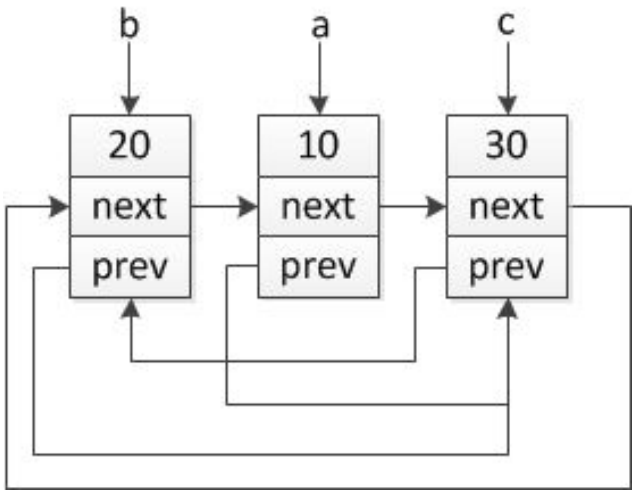
```
node *a, *b, *c;
a = new node;
a->info = 10;
b = new node;
b->info = 20;
c = new node;
c->info = 30;
a->next = c; a->prev=c;
b->next = a; b->prev=c;
c->next = b; c->prev=b;
```

```
cout << a->next->info << endl;
cout << a->next->next->info << endl;
cout << b->next->info << endl;
cout << b->next->next->info << endl;
cout << c->next->info << endl;
cout << c->next->next->info << endl;

cout << a->prev->info << endl;
cout << a->prev->prev->info << endl;
cout << b->prev->info << endl;
cout << b->prev->prev->info << endl;
cout << c->prev->info << endl;
cout << c->prev->prev->info << endl;
```

Список руками 2

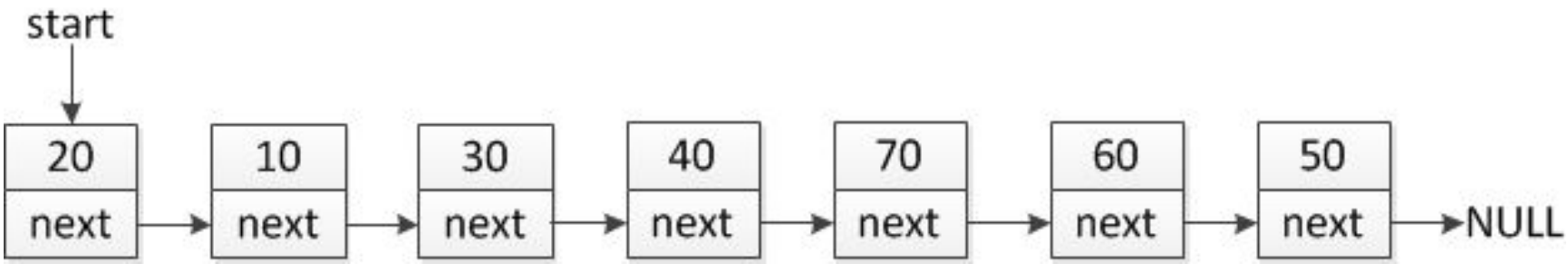
```
node *a, *b, *c;
a = new node;
a->info = 10;
b = new node;
b->info = 20;
c = new node;
c->info = 30;
a->next = c;
b->next = a;
c->next = b;
```

```
cout << a->next->info << endl;
cout << a->next->next->info << endl;
cout << b->next->info << endl;
cout << b->next->next->info << endl;
cout << c->next->info << endl;
cout << c->next->next->info << endl;
cout << a->prev->info << endl;
cout << a->prev->prev->info << endl;
cout << b->prev->info << endl;
cout << b->prev->prev->info << endl;
cout << c->prev->info << endl;
cout << c->prev->prev->info << endl;
```



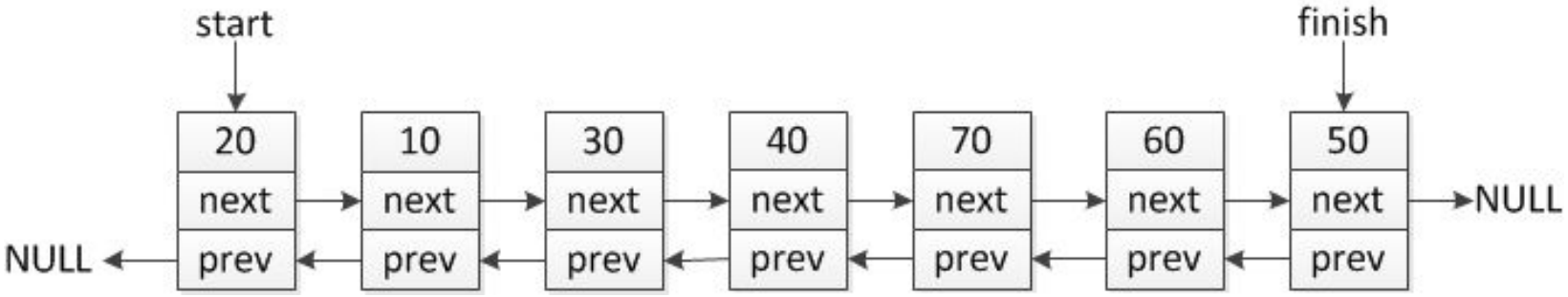
Вывод списка

```
for(node* cur = start; cur!=NULL; cur = cur->next){
    cout << cur->info << endl;
}
```

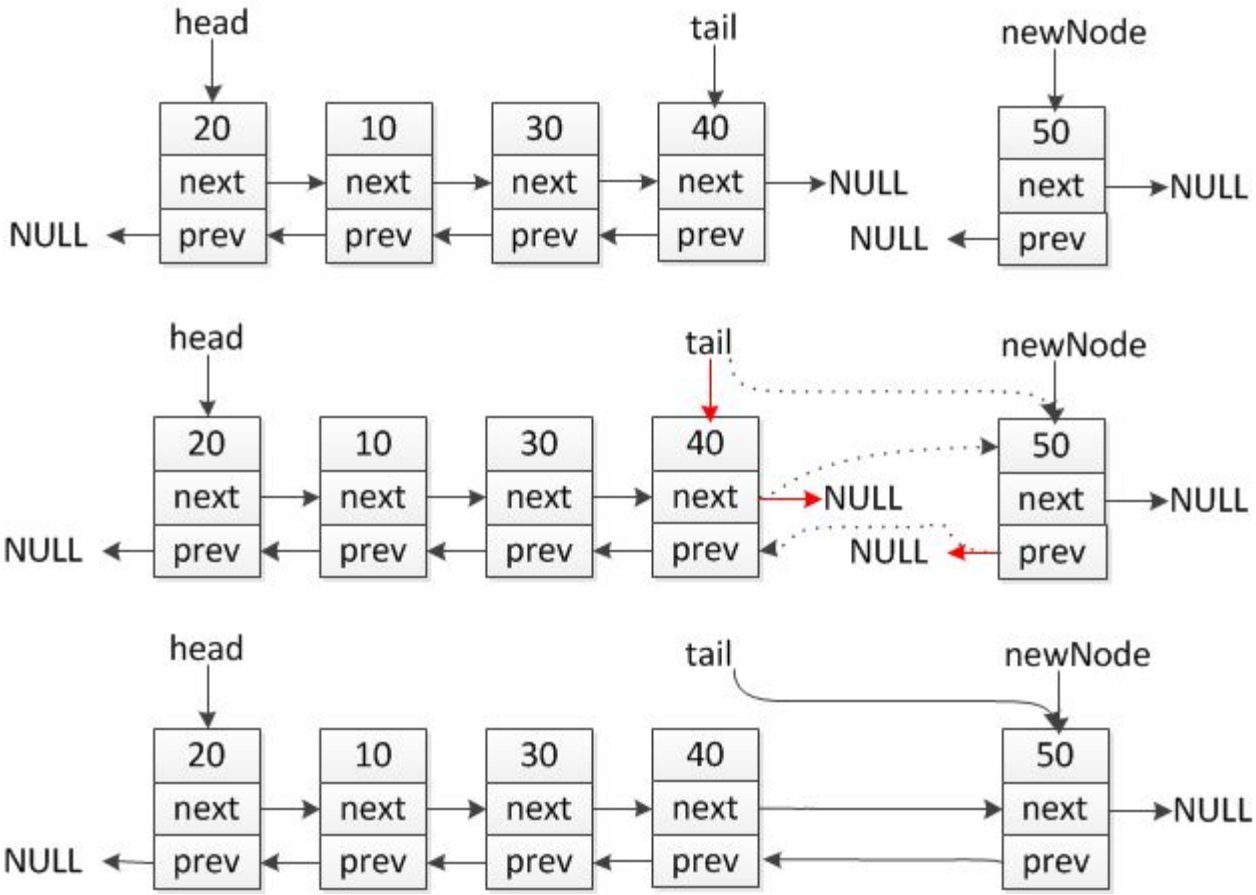


Вывод списка

```
for(node* cur = start; cur!=NULL; cur = cur->next){
    cout << cur->info << endl;
}
for(node* cur = finish; cur!=NULL; cur = cur->prev){
    cout << cur->info << endl;
}
```

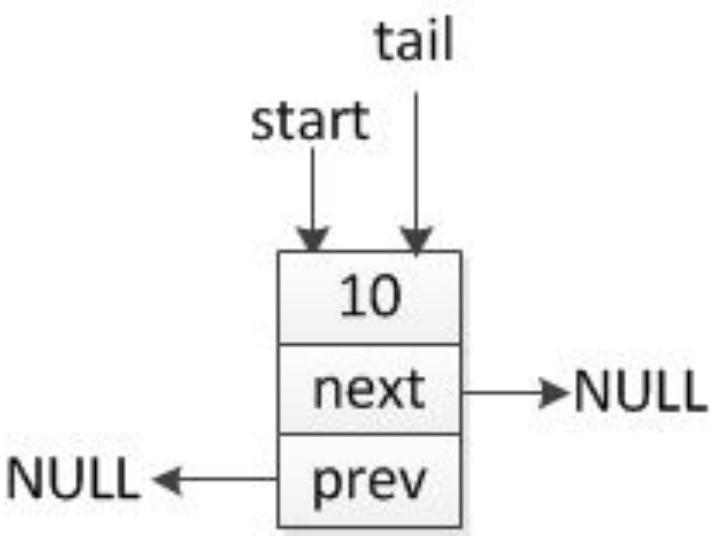


Дополнение списка




```
newNode = new node;
newNode->info = 50;
newNode->next = NULL;
newNode->prev = NULL;

tail->next = newNode;
newNode->prev = tail;
tail=newNode;
```

Создание списка с нуля




```
node *newNode = new node;
newNode->info = 10;
newNode->next = NULL;
newNode->prev = NULL;
start = newNode;
tail = newNode;
```

Ввод-обработка-вывод

```
node *head=NULL, *tail=NULL, *newNode;  int x;
while(cin>>x){
        newNode = new node;
        newNode->info = x;
        newNode->next = NULL;
        newNode->prev = NULL;
        if(tail==NULL){
                head = newNode;
                tail = newNode;
        } else {
                tail->next = newNode;
                newNode->prev = tail;
                tail = newNode;
        }
}
```

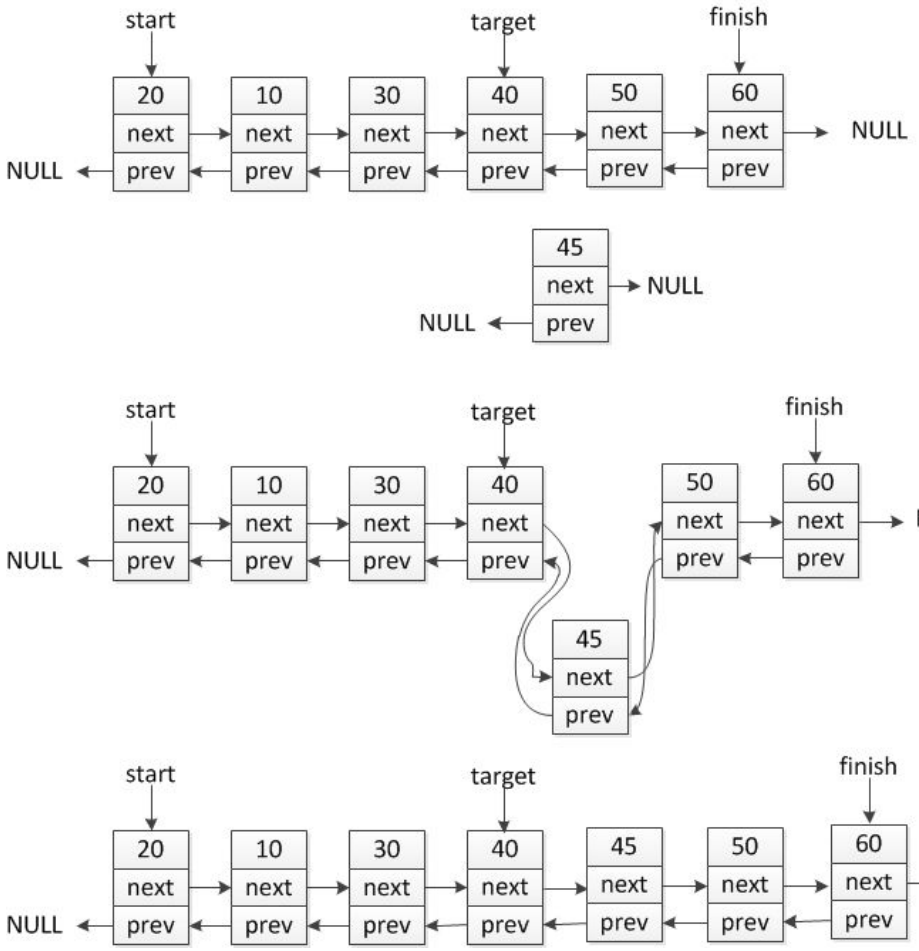
Ввод-обработка-вывод

```
for(node* cur = head; cur!=NULL; cur=cur->next){
	cout << cur->info << " ";
}
cout << endl;
for(node* cur = tail; cur!=NULL; cur=cur->prev){
	cout << cur->info << " ";
}
cout << endl;
```

Ввод-обработка-вывод

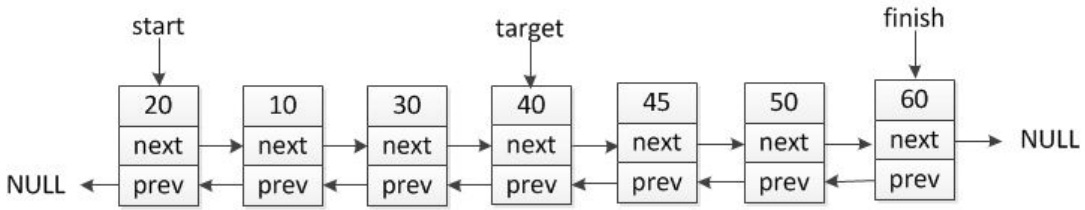
```
for(node* cur = head; cur!=NULL; cur=cur->next){
	cur->info *= 2;
}
for(node* cur = head; cur!=NULL; cur=cur->next){
	cout << cur->info << " ";
}
cout << endl;
for(node* cur = tail; cur!=NULL; cur=cur->prev){
	cout << cur->info << " ";
}
cout << endl;
```

Вставка узла

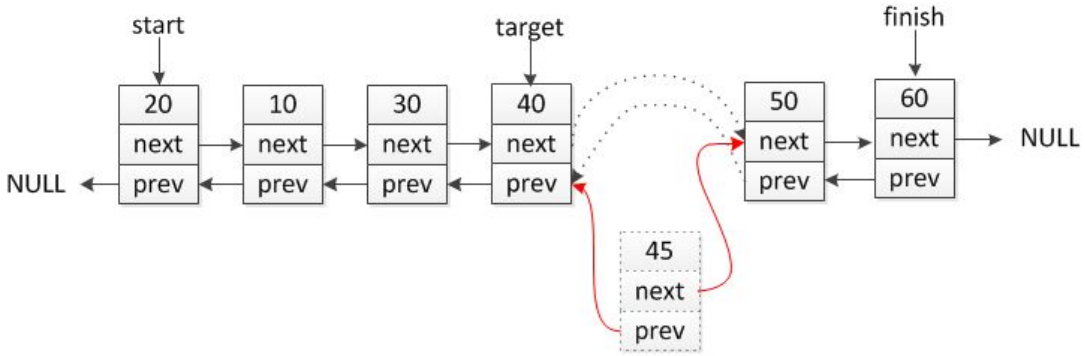



```
newNode = new node;
newNode->info = 45;
newNode->next = NULL;
newNode->prev = NULL;

newNode->next = target->next;
newNode->prev = target;
target->next->prev = newNode;
target->next = newNode;
```

Удаление узла



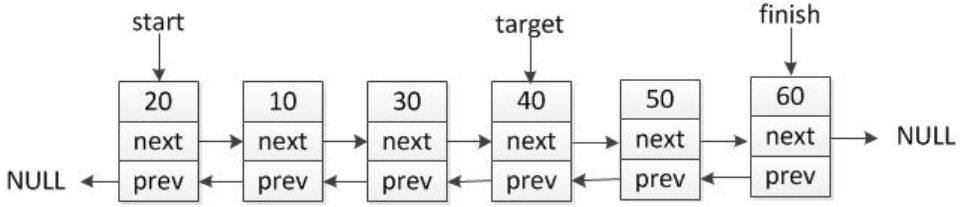
killNode = target->next;



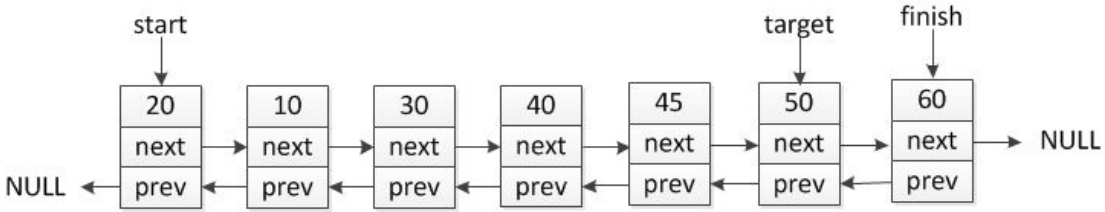
target->next->next->prev = target;

target->next = target->next->next;

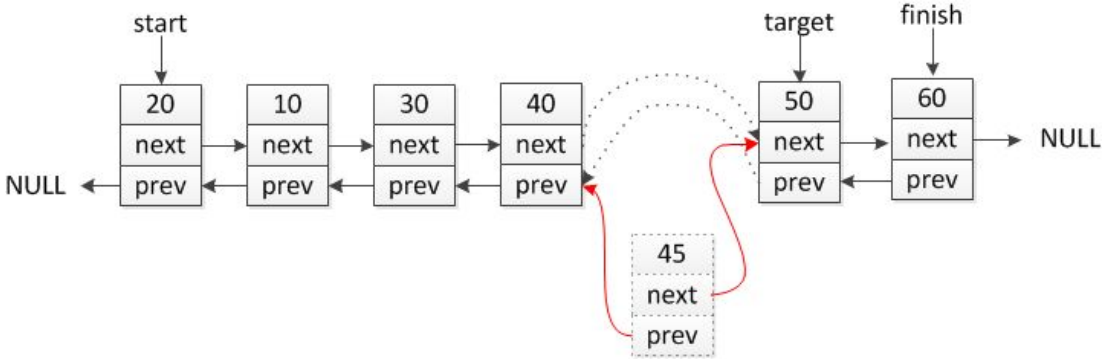
delete killNode;



Удаление узла



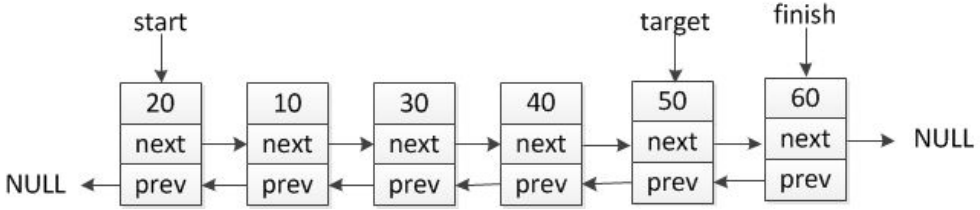
killNode = target->prev;



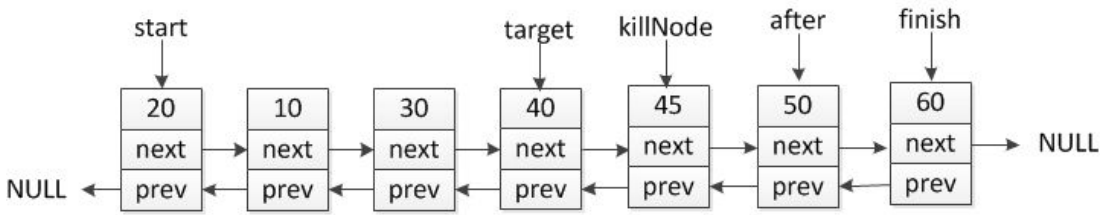
target->prev->prev->next = target;

target->prev = target->prev->prev;

delete killNode;

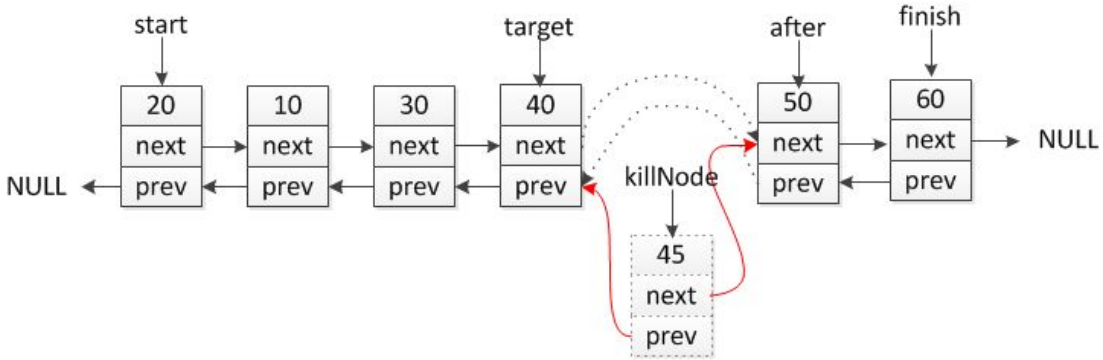


Удаление узла



killNode = target->next;

after = target->next->next;



after ->prev = target;

target->next = after;

delete killNode;