

② better than ①, implemented in `std::vector`  
(caveats?)

w/ "reserve" functionality

\* functionality abstraction

doubly & singly linked list & array

list : iterative <sup>(positional)</sup> access

`insert(p, e)` insert at position  
`elem(p)` element at position  
`begin()` starting position

`p != end()`  $\Leftarrow$  `isEnd(p)` is p the end?  
`nextOf(p)` go to next element of p  
`erase(p)`

<sup>p</sup> iterator: abstraction for

- index in sparse array
- index/pointer in dense array
- pointer in linked list

	sparse array	dense array	list
<code>begin</code>	0	<code>&amp;arr[0]</code>	head
<code>end</code>	<code>n+1</code>	<code>&amp;arr[n+1]</code>	NULL
<code>nextOf(p)</code>	<code>p+1</code>	<code>p++</code>	<code>p -&gt; next</code>
<code>elem(p)</code>	<code>at(p)</code>	<code>(*p)</code>	<code>p -&gt; value</code>

- `iterator < container-type >`, "safe" pointer in some sense
- overload "++" to do `nextOf`, override "\*" to do `elem`
- `int sum = 0;`

`for ( iterator < list<int> > p = c.begin(); p != c.end(); p++ ) {`

*can now "freely" change this one*

`sum += (*p);`

`}`

STL list : doubly linked list

\* sequence : vector + list + i  $\Leftrightarrow$  p