Admin

- Today's topics
  - Stack, Queue implementations
  - Start Editor Buffer case study
- Reading
  - Ch 10 & 9

Text editor case study

- Command-line text editing commands
  - `F` Move cursor forward one character position
  - `B` Move cursor backward one character position
  - `J` Jump to start of buffer (before first character)
  - `E` Move cursor to end of buffer (after last character)
  - `Ixxx` Insert characters xxx at current cursor position
  - `D` Delete character after current cursor position
- Buffer requirements
  - Sequence of characters + cursor position
  - Operations to match commands above
- What to learn?
  - Implementation choices, performance implications

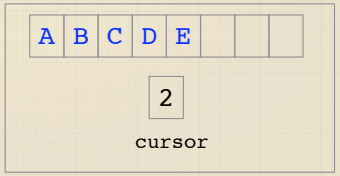
Buffer class interface

```
class Buffer {
  public:
    Buffer();
    ~Buffer();

      void moveCursorForward();
      void moveCursorBackward();

      void moveCursorToStart();
      void moveCursorToEnd();

      void insertCharacter(char ch);
      void deleteCharacter();

      void display();

  private:
         // TBD!
};
```

Buffer layered on Vector

- Need character data + cursor
  - Chars in Vector<char>
  - Represent cursor as integer index
    - Minor detail -- is index before/after cursor?
- Buffer contains: AB|CDE

```
// for Buffer class
private:
   Vector<char> chars;
   int cursor;
```



Evaluate Vector Buffer

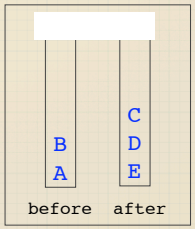
Buffer()	O(1)
~Buffer()	O(1)
moveCursorForward()	O(1)
moveCursorBackward()	O(1)
moveCursorToStart()	O(1)
moveCursorToEnd()	O(1)
insertCharacter()	O(N)
deleteCharacter()	O(N)
Space used	~1 byte per char

Buffer layered on Stack

- Inspiration: add/remove at end of vector is fast
  - If chars next to cursor were at end…
    - Build on top of stack?
      - Another layered abstraction!
    - How is cursor represented?

- Buffer contains: AB|CDE

```
// for Buffer class
private:
   Stack<char> before, after;
```



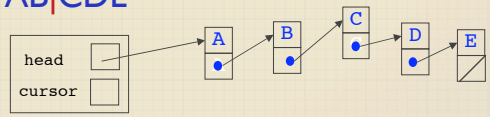
Compare implementations

	Vector	Stack
Buffer()	O(1)	O(1)
~Buffer()	O(1)	O(1)
moveCursorForward()	O(1)	O(1)
moveCursorBackward()	O(1)	O(1)
moveCursorToStart()	O(1)	O(N)
moveCursorToEnd()	O(1)	O(N)
insertCharacter()	O(N)	O(1)
deleteCharacter()	O(N)	O(1)
Space used	1N	2N

Buffer as linked list

- Inspiration: contiguous memory is constraining
  - Connect chars without locality
  - Linked list to the rescue!

- Buffer contains: AB|CDE




```
// for Buffer class
private:
   struct cellT {
      char ch;
      cellT *next;
   };
   cellT *head, *cursor;
```