## Software Design (C++) 6. Other Useful Things in C++

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## Outline

- String streams
- Function objects & lambdas
- Variadic templates
- Concurrency (Threads, Atomics, Futures)



- C++ supports reading and writing in-memory streams based on string buffers
  - Can use the same operators and functions as for other streams
- Let's look at an example in code:
  - <u>http://www.cs.helsinki.fi/u/aptuovin/cplusplus/s1</u>
    <u>4/strstreams.zip</u>











## Variadic templates

- Since C++11
- A variadic template can take an arbitrary number of template arguments
  - Can be used to create functions that take variable number of arguments
  - Often the better choice because they do not impose restrictions on the types of the arguments, do not perform integral and floating-point promotions, and are type safe
- For an example, see <u>http://en.cppreference.com/w/cpp/language/paramet</u> <u>er\_pack</u>



## Concurrency

- C++14 is going to add even more features to support developers who need to write responsive applications
  - See Herb Sutter's talk at C++ and Beyond 2012 that discusses the current and planned features of C++ <u>http://channel9.msdn.com/Shows/Going+Deep/C-</u> <u>and-Beyond-2012-Herb-Sutter-Concurrency-and-</u> <u>Parallelism</u>
  - This is an advanced level talk and it requires at least general understanding of the concepts presented in Boehm's talk