SystemC 3.0 Library Update

Laurent Maillet-Contoz, SystemC LWG Chair

Andy Goodrich, SystemC LWG Co-Chair

Outline

- SystemC 3.0.0 library

- Datatypes performance improvements

- SystemC non regression tests

- Windows DLL support

- Overall cleanup

- Summary

SystemC 3.0.0 library

- Implementation aligned to IEEE 1666-2023 revision
  - See previous presentations
    - Sept'23 SystemC Evolution Fika (https://systemc.org/events/scef202309/)
    - SystemC Evolution Day '23

- Progressive alignment to C++17 standard

- This is a major release

  - Some APIs have changed

  - Some implementation–specific functions (not part of the IEEE standard) no longer available

sc_biguint & sc_bigint Performance Improvements

- Storing 32 bits rather than 30 bits per word
- Math performed using twos-complement instead of sign-magnitude
- Bit access
- Bit range reads and writes
- Operator and method invocation overhead
- Expanding use of template information in operator and method bodies
- Initialization overhead
- Data storage allocation/deallocation overhead

Up to 20x performance improvement!

SystemC non-regression tests

- So far maintained in a separate repo (to be archived)
  - https://github.com/OSCI-WG/systemc-regressions

- From SystemC 3.0.0 final version, integrated in the main repo
  - Under systemc/tests/
  - Including Cmake support

- Preparing for continuous integration through GitHub actions
  - As soon as pushed on https://github.com/accellera-official/systemc

Windows DLL support

- Windows DLL build now supported for MSVC17 and beyond

- `cmake`

  - Specify build system generator e.g. "Visual Studio 16 2019" and compiler "msvc"

  - Add option `-DBUILD_SHARED_LIBS=ON`

- Visual Studio

  - Open solution file (*.sln)

  - Select configuration ReleaseDLL or DebugDLL

- Minor open issue

  - Linker warning LNK4006 (duplicate symbols) can be ignored

- Note

  - Do not forget to add the `systemc-<version>.dll` to your Windows Environment Path

General cleanup

- About 40 Pull Requests merged for the final release related to
  - Fix of UTF-8 issues reported by some compilers
  - sc_string (sc_string_old removed, sc_string now remapped to std::string)
  - Removal of unused meta programming helpers: No longer needed thanks to C++17 migration
  - Removal of various preprocessor macros, either
    - Temporarily introduced to help with the adoption of the IEEE 1666-2011 standard
    - Now irrelevant with C++17 alignment
    - Now unconditionally enabled throughout library, examples, and tests
  - sc_vector implementation updates to use native C++17 features
  - QuickThreads: drop legacy coroutine stack allocation based on malloc to use mmap
  - Windows support: Mingw64, MSVC 2017
  - Tests cleanup
  - Removal of embedded Boost headers
    - Note: move of sc_bind from macros to functions not propagated to IEEE 1666-2023
  - More to come on CMake-based flow improvements

Summary

- SystemC 3.0: a significant step forward
  - C++17 alignment
  - Datatypes performance improvements
  - Streamlining of SystemC regression tests in main repo
  - Windows DLL support
  - General cleanup

Q&A