longjmp() from signal handler.

Problem being solved:

Currently, there is no way to leave a signal handler for *SIGFPE* and continue execution. *abort()* and *_Exit()* are the only two functions that can be called from a signal handler; both result in program termination. Both *return* (for SIGFPE, SIGILL, SIGSEGV, or implementation-defined values) and *longjmp()* (for any signal) being used by a signal handler results in undefined behaviour.

Since a *SIGFPE* need not happen during a floating-point instruction, that is, it may happen tens or hundreds of integer instructions later, doing a return from the signal handler for *SIGFPE* makes no sense and remains undefined behaviour with this feature. Also, if the *SIGFPE* does happen with the exceptional floating-point instruction, doing a return would go back to the same bad place, so unless a portable way of altering the instruction’s operands were found, the same *SIGFPE* would re-happen.

Issue: Should this be limited to just SIGFPE?

Existing practice (of longjmp() from signal handlers of at least SIGFPE): gcc, MSVC, ...

This proposal is an optional feature, and current implementation need do nothing to support it.

Alternate solution: Add *longjmp()* to the list of allowed functions in paragraph #5 in 7.14.1.1. This would be a new requirement on existing implementations.

Solution:

Add to 7.14 Signal handling <signal.h>, new paragraphs after #4.

The implementation defines

__STDC_LONGJMP_FROM_SIGNAL_HANDLER__

if it supports *longjmp()* from a signal handler for any signal.

The user defines

__WANT_LONGJMP_FROM_SIGNAL_HANDLER__

to tell the implementation that it will be doing *longjmp()* from signal handlers. All translation units shall define this symbol if any translation unit defines this symbol. Note: This is for implementations that need to do different things for signal handlers depending upon *longjmp()*; it need not have any effect.

Add to 7.14.1.1 The signal function, a new paragraph after #5.

If both __STDC_LONGJMP_FROM_SIGNAL_HANDLER__ and __WANT_LONGJMP_FROM_SIGNAL_HANDLER__ are defined, then signal handlers can then do a *longjmp()* for any signal handled, including *SIGFPE*, *SIGILL*, and *SIGSEGV*.

Words for Rationale: Are any needed?