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High-performance C++ implementations for valarrays
(Rev. 3)

Introduction

This proposal presents an alternative to version 2 which allows expression templates while allowing previously conformant implementations to remain so without requiring any changes.

Proposal

- a) Renumber paragraph 26.3/3 to 26.3/6.
- b) Insert the following 3 paragraphs (26.3/3-5):
 - 3 Any function returning a `valarray<T>` is permitted to return an object of another type, provided all the const member functions of `valarray<T>` are also applicable to this type. This return type shall not add more than two levels of template nesting over the most deeply nested argument type¹.
 - 4 Implementations introducing such replacement types shall provide additional functions and operators as follows:
 - for every function taking a `const valarray<T>&`, identical functions taking the replacement types must be added;
 - for every function taking two `const valarray<T>&` arguments, identical functions taking any combination of `valarray<T>` `const&` and replacement types must be added.
 - 5 In particular, an implementation must allow a `valarray<T>` to be constructed from such replacement types and must allow assignments and computed assignments of such types to `valarray<T>`, `slice_array<T>`, `gslice_array<T>`, `mask_array<T>` and `indirect_array<T>`.

¹ Appendix B recommends a minimum number of recursively nested template instantiations. This requirement thus indirectly suggests a minimum allowable complexity for `valarray` expressions.