

Doc. No.: X3J16/95-0096  
WG21/ N0696  
Date: May 29, 1995  
Project: Programming Language C++  
Reply To: Richard K. Wilhelm  
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## Clause 21 (Strings Library) Issues List Revision 4

### Revision History

Version 1 - January 30, 1995: Distributed in pre-Austin mailing.

Version 2 - March 6, 1995: Distributed at Austin meeting.

Version 3 - March 24, 1995: Distributed in post-Austin mailing. Several issues added. Several issues updated to reflect decisions at Austin meeting.

Version 4 - May 19, 1994: Distributed in pre-Monetary mailing.

### Introduction

This document is a summary of the issues identified in Clause 21. For each issue the status, a short description, and pointers to relevant reflector messages and papers are given. This evolving document will serve as a basis of discussion and historical record for Strings issues and as a foundation of proposals for resolving specific issues.

For clarity, active issues are separated from issues recently closed. Closed issues are retained for one revision of the paper to serve as a record of recent resolutions. Subsequently, they will be removed from the paper for brevity.

### Active Issues

#### Issue Number: 21-002

Title: Are string\_traits members char\_in() and char\_out() necessary?

Section: 21.1.1.1 [lib.string.char.traits]

Status: active

Description:

In lib-3398, Nathan Myers writes:

Looking at Clause 21, Strings, I find some string\_traits static members:

```
static basic_istream<charT>
    string_char_traits::char_in(basic_istream<charT>& is,
                                charT& a)
{ return is >> a; }
```

```
static basic_istream<charT>
    string_char_traits::char_out(basic_ostream<charT>& os,
                                charT& a)
```

```
{ return os << a; }
```

Are they necessary? If so, shouldn't they be parameterized on ios\_traits? And shouldn't they default to use streambuf put() and get()?

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[Note: lib-3398 contained a typo in which `char_in()` and `char_out()` were incorrectly specified as being members of `basic_string`. The slight error is corrected above.]

See issue 21-008 for additional comments on this subject.

### Proposed Resolution:

Remove the members `string_char_traits::char_in()` and `string_char_traits::char_out()`.

Requester: Nathan Myers: [myersn@roguewave.com](mailto:myersn@roguewave.com)

Owner:

Emails: lib-3398

Papers: (none)

### Issue Number: 21-004

Title: Character-oriented replace function has incorrect signature

Section: 21.1.1.8.6 [lib.string::replace]

Status: active

### Description:

As specified in N0557=94-0170, which was accepted in Valley Forge, the character-oriented replace member has the interface:

```
basic_string<T>&
replace(size_type pos, size_type n, const T c = T());
```

This interface should be as follows:

```
basic_string<T>&
replace(size_type pos, size_type n1,
        size_type n2, const T c = T());
```

This change was inadvertently introduced and should be removed.

### Proposed Resolution:

This interface should be as follows:

```
basic_string<T>&
replace(size_type pos, size_type n1,
        size_type n2, const T c = T());
```

Returns:

```
replace(pos, n1, basic_string<charT, traits, Allocator>(n, c));
```

This change was inadvertently introduced and should be removed.

Requester: Rick Wilhelm: [rkw@chi.andersen.com](mailto:rkw@chi.andersen.com)

Owner: Rick Wilhelm

Emails: (none)

Papers: 95-0028=N0628

### Issue Number: 21-005

Title: How come the string class does not have a `prepend()` function?

Section: 21.1.3.5 [lib.string::append]

Status: active

### Description:

Judy thinks the `prepend` interface(s) should look just like the `append()` interfaces described in 21.1.1.3.5 with the appropriate wording changes.

### Proposed Resolution:

No change, close the issue. There has been no proposal forthcoming for this issue.

Requester: Judy Ward: [ward@roguewave.com](mailto:ward@roguewave.com)

Owner:

Emails: (none)

Papers: (none)

**Issue Number: 21-007**

Title: Should the `string_char_traits` speed-up functions be specified as inline?  
Section: 21.1.1.1 [lib.string.char.traits]  
Status: active  
Description:

The `string_char_traits` speed-up functions:

```
static int compare(const char_type* s1, const char_type* s2,
                  size_t n);
static size_t length(const char_type*);
static char_type* copy(char_type*, const char_type*, size_t);
```

were originally proposed as being inline for efficiency. In the WP (dated 1 February 1995), they are not specified as inline.

Proposed Resolution:

No change, close the issue. The general consensus of library reflector messages and discussion in Austin was: inlining functions was an implementation detail and that functions could not be specified as inline in the Standard.

Requester: Takanori Adachi (taka@miwa.co.jp)  
Owner:  
Emails: lib-3519, lib-3520, lib-3522, lib-3523  
Papers: (none)

**Issue Number: 21-008**

Title: Should an `iostream` inserter and extractor be specified for `basic_string`?  
Section: 21.1.1.1 [lib.string.char.traits]  
Status: active  
Description:

In private email, Takanori Adachi wrote:

“In my original `basic_string` paper, I gave up trying to introduce the inserter and extractor operators since I felt that there is a traits-passing problem from `basic_string` to `basic_ostream`. But in the present WP, they are introduced as:

```
template<class charT, class traits, class Allocator>
basic_istream<charT>
operator>>(basic_istream<charT>& is,
          basic_string<charT,traits,Allocator>& a);
```

```
template<class charT, class traits, class Allocator>
basic_ostream<charT>
operator<<(basic_ostream<charT>& os,
          basic_string<charT,traits,Allocator>& a);
```

without considering the `ios_char_traits`, which seems to me to be a partial solution.

“I think, in order not to lose the power of traits, they should be replaced with the following:

```
template<class charT, class traits, class Allocator,
        class ios_traits = ios_char_traits(traits)>
basic_istream<charT, ios_traits>
operator>>(basic_istream<charT, ios_traits>& is,
          basic_string<charT,traits,Allocator>& a);
template<class charT, class traits, class Allocator,
        class ios_traits = ios_char_traits(traits)>
basic_ostream<charT, ios_traits>
operator<<(basic_ostream<charT, ios_traits>& os,
          basic_string<charT,traits,Allocator>& a);
```

when those operators are included in the `basic_string`.

“By the way, if you accept the above solution, you will realize there still need to be additional changes for the classes, `ios_char_traits` and `string_char_traits`. For the `ios_char_traits`, there will need to be a constructor like:

```
template<class string_traits>
    ios_char_traits(string_traits traits);
```

and the mechanism to reflect members of traits to the behaviors of the default functions of `ios_char_traits`, causing some new overhead in the `iostream` library.

“For the `string_char_traits`, two members, `char_in` and `char_out` will be parameterized with `ios_traits` like:

```
template<class ios_traits>
    static basic_istream<charT,ios_traits>&
        char_in(basic_istream<charT,ios_traits>& is, charT& a);
template<class ios_traits>
    static basic_ostream<charT,ios_traits>&
        char_out(basic_ostream<charT,ios_traits>& os, charT& a);
```

“My position is on the side of removing those operators from the `basic_string`. But if they remain, we should prepare to accept a somewhat complicated, full solution like the above.”

**Proposed Resolution:**

No changes required to address the issue. Close the resolution.

The full templation of `operator<<()` and `operator>>()` was accomplished with `iostreams` resolutions in Austin. See issue 21-002 regarding the `char_in()` and `char_out()` members of traits.

**Requester:** Takanori Adachi (taka@miwa.co.jp)

**Owner:**

**Emails:** (none)

**Papers:** (none)

**Issue Number: 21-012**

**Title:** Why are character parameters to the string functions passed by value?

**Section:** 21.1.1.1 [lib.string.char.traits]

**Status:** active

**Description:**

In the string functions, character parameters are specified as being passed by “charT”. In the past, the LWG had decided that char-like types should be considered cheap enough to pass by value.

However during discussions at the Austin meeting, the LWG formed the consensus that characters should be passed by reference. The rationale was: for most character types, on most architectures, it was as efficient for characters to be passed by references instead of by value. The importance of reference parameters arrived in atypical character types which might be considerably larger than ASCII characters

**Proposed Resolution:**

All character parameters to all string functions will be passed by const reference.

**Requester:** Rick Wilhelm: rkw@chi.andersen.com

**Owner:**

**Emails:** (none)

**Papers:** (none)

**Issue Number: 21-013**

**Title:** There is no provision for errors caused by implementation limits.

**Section:** 21.1.1.2 [lib.basic.string]

Status: active

Description:

In private email, John Dlugosz wrote:

“There is no provision for errors caused by implementation limits. The class handles strings up to length NPOS-1, with no specified way to throw an error saying "I can't do that!" for shorter values. In my implementation I'm simulating an out-of-memory error if an operation exceeds a `maxcount` length, since that's what would presumably happen anyway. The maxcount arises due to arithmetic overflow: I'm limited to `size_t-(small constant)_bytes_`, not elements, and an element may be any size. I can't compute the memory requirements without getting an unreported arithmetic overflow, so I have to check in advance for this instantiation-specific maxcount.

“In order to simulate the out of memory condition, I just call `new` on NPOS bytes. That way I get the "correct" behavior for any installed `new_handler` or replacement operator `new()` that may exist. However, that is not the best solution for a few reasons. First, it will fail if the implementation `_does_` in fact allocate NPOS bytes without error. Second, an out-of-memory exception might not be the appropriate way for a program to recover from this problem. Third, it is less efficient, since by spec I must test for an argument of NPOS anyway, and take one action and `_then_` test for the smaller maxcount and take another action. To summarize, I think that a "length error" should be allowed at an implementation defined size limit which is less than or equal to NPOS. There should also be a function available to return this value.cause.”

Proposed Resolution:

Requester: John Dlugosz: [jdlugosz@objectspace.com](mailto:jdlugosz@objectspace.com)

Owner:

Emails: (none)

Papers: (none)

**Issue Number: 21-014**

Title: Argument order for `copy()` is incorrect..

Section: 21.1.1.8.7 [lib.string::copy]

Status: active

Description:

In private email, John Dlugosz wrote:

“In `copy()` the arguments are in a different order than on other functions. I suppose this was to provide for a default on `pos`. However, if someone does specify both he will be likely to get them backwards and the compiler will not catch this. I feel it is a point of usability that is not worth the default argument.

Provide two forms of `copy()` instead:

```
copy (dest, pos, len);  
copy (dest, len);
```

Note: The current interface to `copy` is:

```
size_type copy(charT* s, size_type n, size_type pos=0);
```

Proposed Resolution:

Provide two forms of `copy()`:

```
size_type copy(charT* s, size_type pos, size_type n);
```

This function differs from the current `copy` only in the order of its last two arguments and the lack of a default argument.

```
size_type copy(charT* s, size_type n);
```

Returns:

```
copy(s, 0, n);
```

.Requester: John Dlugosz: jdlugosz@objectspace.com  
Owner:  
Emails: (none)  
Papers: (none)

**Issue Number: 21-015**

Title: The copy() member should be const.  
Section: 21.1.1.4.18 [lib.string::copy]  
Status: active  
Description:

In private email, John Dlugosz wrote:  
“In copy(), I see no reason for not making the function const. In my implementation, I made it so.”

Note: The current interface to copy is:

```
size_type copy(charT* s, size_type n, size_type pos=0);
```

**Proposed Resolution:**

Add the const quaifier to the copy member.

Requester: John Dlugosz: jdlugosz@objectspace.com  
Owner:  
Emails: (none)  
Papers: (none)

**Issue Number: 21-016**

Title: The error conditions are not well-specified for the find() and rfind() functions.  
Section: 21.1.1.4.20 [lib.string::find]  
Status: active  
Description:

In private email, John Dlugosz wrote:  
“The error conditions are not very well specified for the find() and rfind() functions, nor do I feel that they are the most appropriate choice.

“My interpretation of 21.1.1.4.20 [lib.string::find] is that

1. an empty string will be found anywhere, so will always return `pos'.
2. passing in a pos that is too large is not an error, unlike most other functions in this class. Instead, it fails to match and returns NPOS. This is not explicit, but requires careful reading of the definition to figure out. However, rule 2 takes precedence over rule 1, so that searching for the empty string at an illegal position is not found.

“I have three problems with this. First, making such boundary conditions or error conditions implicit rather than explicit will mean that users don't get a clear quick answer, and implementors may miss something and implement it incorrectly. I doubt many will realize that 2 takes precedence over 1 above, for example, and may happen to get it backwards. Second, the treatment of `pos' values out of range is inconsistant with the rest of the class. Third, it saves nothing in the implementation. Although as written it would seem that the boundary condition of pos out of range is handled naturally if you implement it the way it reads, that is not the case. The size\_t domain cannot handle negative numbers, and the "natural" behavior is an incorrect result. Instead, an explicit test for the value of pos is needed in the code, before proceeding with the real work. As long as this test is necessary anyway, why not just throw a range error? Returning NPOS saves nothing in the implementation efficiency for normal in-range searches.”

Proposed Resolution:

Requester: John Dlugosz: [jdlugosz@objectspace.com](mailto:jdlugosz@objectspace.com)  
Owner:  
Emails: (none)  
Papers: (none)

**Issue Number: 21-017**

Title: Can `reserve()` cause construction of characters?.  
Section: 21.1.1.4.16 [lib.string::reserve]  
Status: active  
Description:

In private email, John Dlugosz wrote:  
"Also, totally unspecified, is the treatment of the `reserve' area with respect to element creation and destruction. I chose to construct elements in the reserve area right away, and then the string grows into the reserve area using assignment semantics. This causes dramatic simplification in several areas, and allows me to implement it without the need for in-place construction and explicit destructor calls (important when targeting cfront-based compilers)."

Proposed Resolution:

Requester: John Dlugosz: [jdlugosz@objectspace.com](mailto:jdlugosz@objectspace.com)  
Owner:  
Emails: (none)  
Papers: (none)

**Issue Number: 21-018**

Title: Specification of traits class is constraining.  
Section: 21.1.1.1 [lib.string.char.traits]  
Status: active  
Description:

In private email, John Dlugosz wrote:  
"The austerity of the traits class strongly suggests certain implementations and prevents certain optimizations. For a simple example, the `copy()` function does not provide for overlapping copies. Say I have a string "ABr" where A and B represent substrings of some length, and r is unused reserve area. I want to insert "C" into the string, and the length of "ACB" fits into the pre-existing allocation (because C is shorter or equal in size to r). I can't just copy B down to the tail end. Instead, I have to reallocate the whole string and copy the A part also.

"More significantly, the `find()` functions pretty much have to be implemented by a brute-force approach as they are defined-- locate a place where the match occurs. In short, I wish the traits available were richer. It seems inconsistent w.r.t. copy semantics, as explained in [issue 23-017], and it is so simple as to force inefficiencies in the implementation. In addition, it would be nice if additional implementation-specific stuff could be placed in the traits class. This can be done and still allow for user-defined "custom" traits to be created that only have the standard members, by using inheritance."

Proposed Resolution:

Requester: John Dlugosz: [jdlugosz@objectspace.com](mailto:jdlugosz@objectspace.com)  
Owner:  
Emails: (none)  
Papers: (none)

**Issue Number: 21-019**

Title: The `Allocator` template parameter is not reflected in a member typedef.  
Section: 21.1.1.3 [lib.basic.string]  
Status: active  
Description: In lib-3593, Nathan Myers wrote:  
“Looking through the Containers clause of the WP, I notice that, unlike all other class template parameters in the library, the `Allocator` parameter is not reflected in a member typedef.  
  
“The reason for this is, I believe, historical; in earlier versions this parameter was a template template parameter, and the language offers no equivalent of typedef for templates.”

Proposed Resolution:

Now that the parameter is a regular class type, it should be reflected in a member typedef:

```
typedef Allocator allocator_type;  
in each standard container, and in basic_string as well.
```

Requester: Nathan Myers: myersn@roguewave.com  
Owner:  
Emails: lib-3593  
Papers: (none)

**Issue Number: 21-020**

Title: Header for Table 42 is incorrect.  
Section: 21.1.1.4 [lib.string.cons]  
Status: active  
Description: The header for Table 42 shows the arguments to a `basic_string` constructor in the incorrect order:  
“Table 42 - `basic_string(charT, size)` type effects”

Proposed Resolution:

Change the title as follows:  
“Table 42 - `basic_string(size_type, charT)` effects”

Requester: afk@ElSegundoCA.ATTGIS.COM  
(also pointed out by Richard Minner in lib-3711)  
Owner:  
Emails: (none)  
Papers: (none)

**Issue Number: 21-021**

Title: `compare()` has unexpected results  
Section: 21.1.1.9.8 [lib.string::compare]  
Status: active  
Description: The current wording for `compare()` is:  
“Returns:  
the nonzero result if the result of the comparison is nonzero. Otherwise, returns a value as indicated in Table 44.”  
This causes the unexpected result of:  
`string("abcfoo").compare(string("abcx"),0,3)` returns `> 0`, while  
`string("abcfoo").compare(string("abcbar"),0,3)` returns `0`.

Proposed Resolution:

Change the wording to:

“Returns:

If the result of the comparison is nonzero, that nonzero result. Otherwise, if `rlen == n`, 0. Otherwise, a value as indicated in Table 44:”

Requester: Jason Merrill: [jason@cygnus.com](mailto:jason@cygnus.com)  
Owner:  
Emails: lib-3709, lib-3712  
Papers: (none)

**Issue Number: 21-022**

Title: `s.append('c')` appends 99 nulls.  
Section: 21.1.1.8.2 [lib.string::append]  
Status: active  
Description:

In lib-3709, Jason Merrill writes:

“Is it really necessary to have any of the `charT = charT()` default arguments? They seem like much more a source of errors than a useful shortcut. How often are you going to want to add a lot of nulls to your string? Is it really such a hardship to make it explicit when you do?

“When I write `s.append('c')`, I expect it to add a 'c' to the end of the string, not to add 99 nulls. Is there some requirement that prevents it from doing what I want? The default argument doesn't seem to be part of the container or sequence requirements, and having an

```
append(charT c)
```

in addition to the

```
append(size_type n, charT c)
```

(and similar additional functions for `assign`, `insert` and `replace`) would be analogous to the iterator `insert` methods that \*are\* part of the sequence requirements.”

Proposed Resolution:

See 95-0091/N0691.

Requester: Jason Merrill: [jason@cygnus.com](mailto:jason@cygnus.com)  
Owner:  
Emails: lib-3709, lib-3711, lib-3712, lib-3722, lib-3723, lib-3724,  
Papers: 95-0091/N0691

**Issue Number: 21-023**

Title: Non-conforming default `Allocator` arguments  
Section: 21.1.1.4 [lib.string.cons]  
Status: active  
Description:

The defaulted `Allocator` arguments as declared do not conform to the language specification. The specification:

```
explicit basic_string(Allocator& = Allocator());
```

causes a compiler warning.

In lib-3731, Nathan Myers wrote:

“The line of reasoning for making that argument `non-const` was that one would need to call `non-const` members of it. However, that interferes with passing it as a default value. The solution becomes evident when you consider that `basic_string`, or any other collection, must make a copy of the `Allocator` argument anyway; they can use the (`non-const`) copy.”

Proposed Resolution:

Change all defaulted `Allocator` arguments from

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```
Allocator& = Allocator()  
to  
const Allocator& = Allocator()
```

Requester: Judy Ward: ward@roguewave.com  
Owner:  
Emails: lib-3730, lib-3731  
Papers: (none)

### Issue Number: 21-024

Title: Name of traits delimiter function is confusing  
Section: 21.1.1.1 [lib.string.char.traits]  
Status: active  
Description: The name of the `string_char_traits` function is “is\_del”. This has the connotation of “is delete”.

Proposed Resolution:  
Change the name of this member to “is\_delim”.

Requester: John Hinke: jhinke@qds.com  
Owner:  
Emails: (none)  
Papers: (none)

### Issue Number: 21-025

Title: Does `string_char_traits` need a locale?  
Section: 21.1.1.2 [lib.string.char.traits.members]  
Status: active  
Description: The description of the member `string_char_traits::is_del()` says it returns: `isspace()`. This function is subject to localization. Does this mean that `string_char_traits` is locale sensitive?

Proposed Resolution:  
Requester: John Hinke: jhinke@qds.com  
Owner:  
Emails: (none)  
Papers: (none)

### Issue Number: 21-026

Title: Description of `string_char_traits::compare()` is expressed in code.  
Section: 21.1.1.2 [lib.string.char.traits.members]  
Status: active  
Description:

The description of the `string_char_traits` member:  

```
static int compare(const char_type* s1, const char_type* s2,  
                  size_t n);
```

is expressed in code as follows:  

```
for (size_t i=0; i<n; ++i, ++s1, ++s2)  
    if (ne(*s1, *s2))  
        return (lt(*s1, *s2) ? -1 : 1);  
return 0;
```

It should be expressed in prose.

Proposed Resolution:  
Replace the description with the following:  
Returns: 0 iff for each  $i$ :  $0 < i < n$  the expression `eq(*(s1+i), *(s2+i))` is true.  
Otherwise, returns -1 given  $i$  and  $j$  such that for  $j$ :  $0 \leq j < n$ , the expression

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`lt(*(s1+j), *(s2+j))` is true and for each  $i: 0 < i < j$  the expression `eq(*(s1+i), *(s2+i))` is true.  
Otherwise returns 1.

Requester: Rick Wilhelm: rkw@chi.andersen.com  
Owner:  
Emails: (none)  
Papers: (none)

### Issue Number: 21-027

Title: Description of `string_char_traits::compare()` overspecifies return value.  
Section: 21.1.1.2 [lib.string.char.traits.members]  
Status: active  
Description:

The description of the `string_char_traits` member:

```
static int compare(const char_type* s1, const char_type* s2,  
                  size_t n);
```

is expressed in code as follows:

```
for (size_t i=0; i<n; ++i, ++s1, ++s2)  
    if (ne(*s1, *s2))  
        return (lt(*s1, *s2) ? -1 : 1;  
return 0;
```

Specifying the exact return values when the comparison returns “less than” or “greater than” is too constraining.

Proposed Resolution:

Replace “-1” with “an integer less than zero” and replace “1” with “an integer greater than 0”

Requester: Rick Wilhelm: rkw@chi.andersen.com  
Owner:  
Emails: (none)  
Papers: (none)

### Issue Number: 21-028

Title: Description of `string_char_traits::length()` is expressed in code.  
Section: 21.1.1.2 [lib.string.char.traits.members]  
Status: active  
Description:

The description of the `string_char_traits` member:

```
static int length(const char_type* s);
```

is expressed in code as follows:

```
size_t len = 0;  
while (ne(*s++, eos())) ++len;  
return len;
```

It should be expressed in prose.

Proposed Resolution:

Replace the description with the following:

Returns: the lowest value of  $i$  such that for  $i, i \geq 0$ , the expression `ne(*(s+i), eos())` returns false and for each  $j, 0 \leq j \leq i$  the expression `ne(*(s+j), eos())` returns true and.

Requester: Rick Wilhelm: rkw@chi.andersen.com  
Owner:  
Emails: (none)  
Papers: (none)

### Issue Number: 21-029

Title: Description of `string_char_traits::copy()` is overconstraining.  
Section: 21.1.1.2 [lib.string.char.traits.members]

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Status: active

Description:

```
The description of the member string_char_traits::copy ()
char_type* s = s1;
for (size_t i=0; i<n; ++i) assign(*s1++, *s2++);
```

This overconstrains implementations, in that there is no particular reason to do the operations in the order specified. (Box 78).

Proposed Resolution:

Replace the description as follows:

Effects: Copies elements. For each non-negative integer  $i < n$ , performs  
 $*(s1 + i) = *(s2 + i)$ .

Returns:  $s1$ .

Requires:  $s1$  shall not be in the range  $[s2, s2+n)$ .

Requester: Rick Wilhelm: rkw@chi.andersen.com

Owner:

Emails: (none)

Papers: (none)

### Issue Number: 21-030

Title: Description of `string_char_traits::copy()` is silent on overlapping strings.

Section: 21.1.1.2 [lib.string.char.traits.members]

Status: active

Description:

```
The description of the member string_char_traits::copy ()
char_type* s = s1;
for (size_t i=0; i<n; ++i) assign(*s1++, *s2++);
Doesn't explicitly address the issue of overlapping strings.
```

Proposed Resolution:

Add the following to the description of `string_char_traits::copy()`:

Requires:  $s1$  shall not be in the range  $[s2, s2+n)$ .

This is similar to the approach followed by `copy()` in 25.2.1 [lib.alg.copy].

Requester: Rick Wilhelm: rkw@chi.andersen.com

Owner:

Emails: (none)

Papers: (none)

### Issue Number: 21-031

Title: Copy constructor takes extra argument to switch allocator

Section: 21.1.1.4 [lib.string.cons]

Status: active

Description:

The copy constructor:

```
basic_string(
    const basic_string<charT, traits, Allocator>& str,
    size_type pos = 0, size_type n = npos,
    Allocator& = Allocator());
```

takes an extra argument, so that it can be used to copy a string while changing its allocator. Is this the best way to do this? (Box 79).

Proposed Resolution:

Requester: Rick Wilhelm: rkw@chi.andersen.com

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### Issue Number: 21-032

Title: Description for operator+() is incorrect

## Clause 21 (Strings Library) Issues List - 95-0096=N06896

Section: 21.1.1.10.1 [lib.string.string::op+]  
Status: active  
Description:

In the current draft:

```
template<class charT, class traits, class Allocator>
  basic_string<charT, traits, Allocator>
  operator+(const basic_string<charT, traits, Allocator>& lhs,
            const basic_string<charT, traits, Allocator>& rhs);
```

is described by:

Returns: lhs.append(rhs)

These are the incorrect semantics. The lhs argument is not modified, a new string object is created and returned.

(This was pointed out by bob\_kline@stream.com in comp.std.c++.)

Proposed Resolution:

Change the description of this operator to be:

Returns:

```
basic_string<charT, traits, Allocator>(lhs).append(rhs)
```

Requester: Rick Wilhelm: rkw@chi.andersen.com

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Papers: (none)

**Issue Number: 21-033**

Title: Requirements for `const charT*` arguments not specified

Section: throughout clause 21

Status: active

Description:

In the current draft, `basic_string` and `string_char_traits` members which take an argument of type `const charT*` fail to specify that the argument shall not be null. The appropriate constructors specify:

Requires: `s` shall not be a null pointer.

but most of the other members do not.

Proposed Resolution:

Add the following to the descriptions of all `basic_string` and `string_char_traits` functions which take a parameter of type `const charT*`:

Requires: `s` shall not be a null pointer.

where `s` represents the name of the paramter.

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**Issue Number: 21-034**

Title: Inconsistency in requirements statements involving `npos`

Section: 21.1.1.4 [lib.string.cons] and 21.1.1.6 [lib.string.capacity]

Status: active

Description:

In the current draft, the requirements for

```
basic_string(size_type n, charT c, Allocator& = Allocator());
```

read:

Requires: `n < npos`.

and the requirements for

```
void resize(size_type n, charT c);
```

read:

Requires: `n != npos`.

Although semantically equivalent, they are inconsistent and an avoidable source of potential confusion.

Proposed Resolution:

In my opinion, the choice is almost arbitrary. I have a slight preference for :

Requires: `n != npos`.

because I think it better conveys the semantics of an invalid position instead of a number whose value is meaningful as being greater or less than another number..

Requester: Rick Wilhelm: rkw@chi.andersen.com

Owner:

Emails: (none)

Papers: (none)

## Closed Issues

**Issue Number: 21-001**

Title: Should `basic_string` have a `getline()` function?

Section: 21.1.1.4.5 (new) [`lib.string::getline`]

Status: closed

Description:

As identified by Beman Dawes in lib-3367, the 20 September 1994 draft of the WP does not include `getline()`. It was part of the 27 May 1994 draft of the WP. Beman suggested that `getline()` be reinstated with the semantics as specified in the earlier WP draft.

In lib-3408, Nathan Myers responded as follows:

"I'm quite concerned about the semantics implied in the string traits. There, it seems to be assumed that the end-of-line character is the same for all encodings of a character type. But, of course, even in ASCII we see an amazing variety of line-end conventions. Unicode is worse, with all the ASCII control characters and (as I recall) two more line-end characters.

"I fear that we cannot provide internationalized `getline` semantics with the same interface that we have had. I can imagine a `getline()` which takes the user's choice of line ending, but I can imagine you may want any of the available choices to end a line. The locale object's `ctype` facet does not provide an `'is_eol()`' member, and POSIX does not provide the underlying support necessary to implement it in any case.

"It seems clear to me that the `getline` operation depends on the character-encoding in use, and that makes it a locale-dependent operation. It is not clear to me how to propagate the information to the place where it is needed. It would like to avoid a 'virtual-function-call-per-character' when reading lines of text, because of performance problems."

Resolution: Resolved with the acceptance of N0611=95-0011 in Austin.

Requester: Beman Dawes: beman@dawes.win.net

Owner:

Emails: lib-3367, lib-3408, lib-3411, lib-3417, lib-3421

Papers: N0611=95-0011

**Issue Number: 21-003**

Title: Character-oriented `assign` function has incorrect signature

## Clause 21 (Strings Library) Issues List - 95-0096=N06896

Section: 21.1.3.6 [lib.string::assign]  
Status: closed  
Description: As specified in N0557=94-0170, which was accepted in Valley Forge, the character-oriented assign member has the interface:  

```
basic_string<T>& assign(size_type pos, size_type n, const T c = T());
```

This interface should not take have its first parameter. This change was inadvertently introduced and should be removed. This issue will be closed if 2.5.4 of N0628=95-0028 is accepted.

Resolution: In 21.1.1.4.4 [lib.sring::append] and 21.1.4.5 [lib.string::assign], change the interfaces as follows:  

```
basic_string<T>& append(size_type n, T c = T());  
basic_string<T>& assign(size_type n, T c = T());
```

Requester: Rick Wilhelm: rkw@chi.andersen.com  
Owner: Rick Wilhelm  
Emails: (none)  
Papers: 95-0028=N0628

### Issue Number: 21-006

Title: Should the Allocator be the last template argument to basic\_string?  
Section: 21.1.3 [lib.basic.string]  
Status: closed  
Description:

The current form of the basic\_string template is:

```
template<class charT, class Allocator, class traits>
```

The order of these template arguments should be changed to:

```
template<class charT, class traits, class Allocator>
```

because it is more common to change the traits, without changing the allocator. In this case, the default template arguments allow for a simpler declaration of the template, such as:

```
basic_string<wchar_t, my_traits>
```

rather than

```
basic_string<wchar_t, allocator, my_traits> .
```

The rationale mentioned in N0557 (the paper which added the Allocator as a template parameter) indicated that the Allocator is the second template parameter for similarity with other STL container template. However, this is not true. The set and map templates take the Allocator as the final template argument.

Resolution: Amend the WP in section 21.1.1.3 [lib.basic.string] to change the order of the template arguments for basic\_string as follows:

```
template<class charT, class traits = string_char_traits<charT>,  
class Allocator = allocator>  
class basic_string { // ...
```

Accepted at Austin meeting.

Requester: Takanori Adachi (taka@miwa.co.jp)  
Owner:  
Emails: (none)  
Papers: (none)

**Issue Number: 21-009**

Title: Why are character parameters passed as “const charT”?  
Section: 21.1.1.4.{4-6} [lib.string::append], [ lib.string::assign], [lib.string::insert]  
Status: closed  
Description:

The basic\_string members append, assign, and insert have overloaded variations which take a single character as the final parameter. These parameters are specified as “const charT”. Since these parameters are passed by value, the const qualification should be removed.

Resolution:

Amend to WP in section 21.1.1.4.{4-6} [lib.string::append], [ lib.string::assign], [lib.string::insert] to remove the const qualifier from the members which take a character as the final parameter. The member functions should take the following form:

```
basic_string<charT,Allocator,traits>&  
append(size_type n, charT c = charT());  
  
basic_string<charT,Allocator,traits>&  
assign(size_type pos, size_type n, charT c = charT());  
  
basic_string<charT,Allocator,traits>&  
insert(size_type pos, size_type n, charT c = charT());
```

Note: These const qualifiers were inadvertently introduced in N0557=94-0170.

Requester: Rick Wilhelm: rkw@chi.andersen.com  
Owner:  
Emails: (none)  
Papers: (none)

**Issue Number: 21-010**

Title: Should member parameters passed as “const\_pointer”?  
Section: 21.1.3 [lib.basic.string]  
Status: closed  
Description:

In N0557=94-0170, basic\_string was given typedefs for const\_pointer, the pointer type supplied by the allocator. Along with this change, the type of pointer arguments return values was changed from const charT\* to const\_pointer, uniformly.

Unfortunately, this change prevents a string produced by a non-standard allocator from interfacing with C-style arrays of character objects. For example, the following code is no longer legal if the allocators const\_pointer type is not const charT.:

```
basic_string<char, string_char_traits<char>, XAlloc> s("foo");
```

The const\_pointer typedef should only be used when considering character objects which are part of an existing string, not for interfacing with C-style arrays of character objects.

Resolution:

Amend the WP as follows: Arguments to the functions which are currently of type “const\_pointer” should be changed to “const charT\*”. Arguments to functions which are of type “pointer” should be changed to “charT\*”:

These member functions include:

## Clause 21 (Strings Library) Issues List - 95-0096=N06896

```
basic_string(const charT* s, size_type n);
basic_string(const charT* s);
basic_string& operator=(const charT* s);
basic_string& operator+=(const charT* s);
basic_string& append(const charT* s, size_type n);
basic_string& append(const charT* s);
basic_string& assign(const charT* s, size_type n);
basic_string& assign(const charT* s);
basic_string& insert(const charT* s, size_type n);
basic_string& insert(const charT* s);
basic_string& replace(size_type pos, size_type n1,
                    const charT* s);
size_type copy(charT* s, size_type n, size_type pos = 0);
```

Also, change the return type of the `data()` and `cstr()` members as follows:

```
const charT* data() const;
const charT* cstr() const;
```

(Note: due to an editorial problem the current WP, these members have this interface in 21.1.1.4.11 [`lib.string::cstr`] and 21.1.1.4.12 [`lib.string::data`]. They have the `const_pointer` return type in 21.1.1.3 [`lib.basic.string`].

This change also applies to the appropriate algorithm members. They are not listed here for brevity.

Closed at Austin meeting.

Requester: Rick Wilhelm: rkw@chi.andersen.com  
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Papers: (none)

### Issue Number: 21-011

Title: Why are character parameters to the string traits functions passed by reference?  
Section: 21.1.1.1 [`lib.string.char.traits`]  
Status: closed  
Description:

In the string character traits functions, character parameters are specified as being passed by “`const charT&`”. In the past, the LWG has decided that char-like types should be considered cheap enough to pass by value.

Resolution:

All character parameters will be passed by reference, see issue 21-012.

In section 21.1.1.1 [`lib.string.char.traits`], modify the specification for the `string_char_traits` members as follows:

```
static void assign(char_type& c1, char_type c2)
static bool eq(char_type c1, char_type c2)
static bool ne(char_type c1, char_type c2)
static bool lt(char_type c1, char_type c2)
```

Also, modify the following sections as appropriate: 21.1.1.2.{1-4} [`lib.char.traits::assign`], [`lib.char.traits::eq`], [`lib.char.traits::ne`], [`lib.char.traits::lt`].

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