

X3J11/87-196

18 Sep 87
Project 381-D

X3J11 Meeting No. 18
14-18 Sep 87

Sheraton Tara Hotel
1657 Worcester Road
Framingham MA 01701
(617) 879-7200

1. Opening Activities (Brodie)

1.1 Opening Comments

The meeting convened at 9:00 a.m. on Monday, 14 Sep 87, by Chairman Jim Brodie, who welcomed participants new and old to the eighteenth meeting of X3J11, Programming Language C (X3 Project 381D). Host for the meeting was Prime (Johnson). Tom Plum served as Vice Chairman. P.J. Plauger served as secretary.

Brodie emphasized that the goals for this meeting is to resolve remaining substantive issues and to develop the remaining responses to public commentary, so the Committee will feel comfortable in releasing the revised draft for second formal public review after the Dec 87 meeting.

1.2 Housekeeping

Brodie informed the committee that Prime was serving as host for this meeting, so any requests for copies of documents should be funneled through Johnson.

1.3 Approval of Previous Minutes

Plauger submitted the minutes of the previous meeting (87-129) for amendment or correction.

Khushf observed that the minutes should have contained a sentence clarifying why we didn't change the min/max length of string literals.

On p. 20, Prosser reported that "excludes" should be "includes," in describing whether the three standard streams are counted in the macro definition.

With these changes, the minutes were accepted.

1.4 Approval of Agenda

Brodie submitted a Preliminary Agenda (87-149) for approval. With several small changes, the Agenda was approved. The revised Agenda (87-149R) is Attachment II to these minutes.

1.5 Introduction of New Participants

All attendees introduced themselves to the Committee.

1.6 Next Meeting

The next meeting will be held in Austin TX, 07-11 Dec 87, hosted by Tymlabs. The meeting hotel is the S.F. Austin Hotel, Austin. Khushf distributed information on the hotel. She reported that no car should be needed, and that reservations should be made by 21 Nov 87.

1.7 Procedures for this Meeting

Brodie announced that outstanding letters would again be preprocessed by subcommittees. Subcommittees would also be formed to process member papers and to try to focus Committee time on the hottest issues first. To expedite the exchange of views, discussions will take place as a Committee of the Whole, which has fewer parliamentary formalities.

He reminded the Committee that the goal of the December meeting is to vote out the amended draft for a second (and final) formal public review period of 2 months.

1.8 Distribution of New Documents

A number of documents were distributed.

1.9 Review of Action Items

Brodie scanned the previous minutes (87-129) for action items noted.

- ** Not all responses from subcommittee heads have been given to Plum.
- ** Bradbury owes Hudson Rationale words on #note.
- ** Colligan has yet to list contents of library headers.

1.10 X3 Notices (Brodie)

Brodie passed on various bits of news from X3.

He reported that X3J11 no longer needs a unanimous vote to avoid a letter ballot when voting out a draft for public review. A 2/3 vote is sufficient.

There may be a need for X3J11 liaison with a real time subcommittee of POSIX.

1.11 Roll Call

An attendance sheet was circulated and all attendees were

asked to write down their names and addresses. Those in attendance are listed in Attachment I. Forty-four attendees were deemed eligible to vote, having attended at least one of the preceding two meetings and having expressed the intention of becoming voting members. These were:

Bob Barry, Modcomp
Jim Baumbach, Advanced Computer Techniques
Glenda Berkheimer, UNISYS
Robert Bradbury, Oracle Corporation
Oliver Bradley, SAS Institute, Inc.
Jim Brodie, Jim Brodie & Associates
Kevin Brosnan, Alliant Computer Systems
Terry Colligan, Rational Systems, Inc.
Peter Darnell, Stellar
Douglas Davey, Bell Communications Research
Steve Davies, Concurrent Computer Corporation
Shawn Elliott, IBM
Douglas Gwyn, U.S. Army Ballistic Research Lab.
Randy Hudson, Intermetrics Inc.
Paul Jackson, HCR Corp.
Rex Jaeschke, DEC Professional
Bob Jervis, Borland International
Gary Jeter, Harris Computer Systems Div.
Andrew Johnson, Prime Computer, Inc.
Larry Jones, SDRC
Monika Khushf, Tymlabs
Jacklin Kotikian, Masscomp
Tom MacDonald, Cray Research, Inc.
Michael Meissner, Data General
Sue Meloy, Hewlett-Packard
Joe Musacchia, Wang Laboratories, Inc.
Chris Nolan, Digital Equipment Corp.
Thomas Osten, Honeywell Bull
Michael Paton, Motorola, Inc.
John Peyton, Apollo Computer Inc.
P.J. Plauger, Whitesmiths, Ltd.
Tom Plum, Plum Hall
Courtney Prodehl, Mark Williams Co.
David Prosser, AT&T
Chuck Rasbold, Lawrence Livermore National Laboratory
Henry Richardson, Tandem Computers
Larry Rosenthal, Sierra Systems
Tom Sandlin, Gould CSD
Honey Schrecker, International Computers Ltd.
Rick Schubert, NCR Corp.
Carl Sutton, Tektronix
Neil Weidenhofer, Amdahl Corp.
Dave Weil, Microsoft Corp.
Jim Williams, Naval Research Lab

2. Liaison Activities

2.1 IEEE 1003

Gwyn reported that IEEE 1003 is currently meeting in Nashua

1.5 Introduction of New Participants

All attendees introduced themselves to the Committee.

1.6 Next Meeting

The next meeting will be held in Austin TX, 07-11 Dec 87, hosted by Tymlabs. The meeting hotel is the S.F. Austin Hotel, Austin. Khushf distributed information on the hotel. She reported that no car should be needed, and that reservations should be made by 21 Nov 87.

1.7 Procedures for this Meeting

Brodie announced that outstanding letters would again be preprocessed by subcommittees. Subcommittees would also be formed to process member papers and to try to focus Committee time on the hottest issues first. To expedite the exchange of views, discussions will take place as a Committee of the Whole, which has fewer parliamentary formalities.

He reminded the Committee that the goal of the December meeting is to vote out the amended draft for a second (and final) formal public review period of 2 months.

1.8 Distribution of New Documents

A number of documents were distributed.

1.9 Review of Action Items

Brodie scanned the previous minutes (87-129) for action items noted.

- ** Not all responses from subcommittee heads have been given to Plum.
- ** Bradbury owes Hudson Rationale words on #note.
- ** Colligan has yet to list contents of library headers.

1.10 X3 Notices (Brodie)

Brodie passed on various bits of news from X3.

He reported that X3J11 no longer needs a unanimous vote to avoid a letter ballot when voting out a draft for public review. A 2/3 vote is sufficient.

There may be a need for X3J11 liaison with a real time subcommittee of POSIX.

1.11 Roll Call

An attendance sheet was circulated and all attendees were

4. Reports of the Redactors

Prosser presented an updated draft (87-140) and his report (87-143).

Hudson presented an updated draft of the Rationale (87-147).

The Committee thanked both redactors for their efforts.

5. Approval of the Current Draft (87-140)

Brodie asked for any corrections to the latest draft (87-140). One error was reported -- the description of the conditional operator has the cases exactly backwards. This change was accepted as editorial.

Prosser/Hudson

"Move we accept 87-140 as the current draft C standard."

Motion carried, lots/0/0.

6. Review of Prepared Papers

The Committee formed into subgroups to summarize issues common to multiple papers submitted by members.

7. Presentations

MacDonald presented a request (87-154, 87-153#3) that grouping be honored for associative operators, with regrouping permitted only when the behavior is "as if" the change were not made. He summarized four possible choices:

-- go back to K&R rules, requiring temporaries to force grouping

-- keep status quo, requiring temporaries or unary +

-- honor grouping only for floating operands

-- always honor grouping, except when permitted by the "as if" rule.

There was considerable discussion.

Straw vote:

16 honor grouping

16 leave status quo

MacDonald observed that, even if the Committee wishes to keep status quo, it should still consider two changes. There is no need to include the bitwise operators $\&$, $|$, and \wedge in the regrouping discussion, since these are covered by the "as if" rule anyway. And we should probably bless the common practice of rewriting $(A - B)$ as $(A + -B)$ so that subtraction

is also subject to regrouping. For the record, MacDonald requested a roll call vote.

MacDonald/Plauser

"Move we honor grouping for associative operators."

Plauser, yes.

Gwyn, abstain -- just need some grouping method.

Williams, no -- not what C has been.

Sandlin, yes.

Paton, yes.

Jeter, no -- like status quo.

Osten, no -- like status quo.

Davey, yes.

Meloy, no -- unnecessary burden on overflow checkers
leave it to user.

Schubert, absent.

Musacchia, yes.

Jackson, yes.

Schrecker, no -- there's already a way to do it.

Jones, yes.

Brosnan, yes.

MacDonald, yes.

Bradley, no -- unnecessary burden on overflow checkers.

Jaeschke, yes.

Nolan, abstain.

Weil, no -- like status quo.

Rosenthal, no -- that's C, can optimize better with status quo,
can force grouping when needed.

Kotikian, absent.

Darnell, absent.

Baumbach, abstain -- just need some method.

Richardson, no -- like status quo.

Barry, abstain.

Rasbold, yes.

Elliott, no -- might limit optimizations.

Prosser, no -- like status quo.

Hudson, abstain.

Johnson, absent.

Prodehl, no -- like status quo.

Sutton, abstain.

Plum, yes.

Bradbury, yes -- seen no proof that status quo is necessary.

Berkheimer, absent.

Khushf, yes -- can't be worse than other things.

Meissner, no -- not the spirit of C.

Peyton, no -- burden of proof is on changers, unary + is
sufficient, not convinced optimizations are not eliminated.

Davies, no -- draft is adequate.

Brodie, abstain.

Colligan, absent.

Jervis, yes -- limits attractiveness of C.

[Weidenhofer, not yet in attendance]

Motion defeated, 15/15/7.

Elliott presented a request (87-156) that we add a locale specific query capability on local currency conventions. As a result of the discussion, he agreed to change a number of array members to pointers, to better provide for varying length strings of characters.

Straw vote:

16 add monetary query to locale
7 no

Some minor changes were suggested to 87-156.

Straw vote:

18 accept 87-156 as amended
5 no

Elliott/Schrecker

"Move we add locale specific currency information, as in 87-156 as amended."

Motion carried, 22/4/9.

MacDonald, no -- we're generous to international interests, but stingy with scientific, and it's unnecessary baggage.
Bradley, no -- same as MacDonald.
Meloy, no -- not necessarily the best way to do it.
Nolan, abstain -- needs generalizing.
Gwyn, no -- same as Bradley.

Hudson presented a brief summary of proposed changes (87-139, 87-148, 87-153#9, 87-169) to the description of types. He reported that it was still necessary to discuss several substantive changes, and to merge different wordings for the same material.

Osten presented several proposals (87-130, 87-131, 87-144, 87-163) for changes to enums. A clarification of the scope of enum constants was taken as editorial.

There was a discussion of the pros and cons of allowing enum as the base type for bit fields.

Straw vote:

10 add enum bit fields
20 no

Plauser requested that the draft disallow the declaration of enums of unknown content.

Straw vote:

lots disallow enum of unknown content
2 keep them

Plauser/Bradley

"Move we disallow enum of unknown content, as in 87-163."

Motion carried, 26/1/9.

Weidenhofer, no -- it's a non problem.

Prodehl, abstain -- it's like tentative definition issues.

Weil asked that we permit "char enum" and other specific sized enum declarations. There was some discussion of the pros and cons.

Straw vote:

8 allow char enum, etc.
29 no

Crockett (87-146) presented a clarification of the widening rules, that unsigned int widens to unsigned long if int is the same size as long.

Straw vote:

lots accept 87-146 widening clarification
3 no

Prosser/Musacchia

"Move we accept the widening rule clarification as in 87-146."

Motion carried, 31/3/4.

Meloy presented several proposals (87-151, 87-153 p. 16) on changes to offsetof. There were four options discussed:

- make offsetof a keyword, a la the straw vote in Paris.
- make it a constant integer macro.
- make it an rvalue macro.
- eliminate it altogether.

Plauser pushed for complete elimination, asking instead for a parameter giving the storage bound that should be enforced by malloc.

Straw vote:

4 remove offsetof
lots no

There was some discussion of ways to permit offseof to be written as a macro. Prosser suggested reinstating (&x - &y) in constant integer expressions to help write offsetof.

Straw vote:

4 make offsetof a keyword

26 leave it a macro

Prodehl presented several proposals (87-122, 87-153#8, 87-159, 87-161) clarifying the handling of linkage. It was agreed that internal linkage must be specified by writing "static" in the first declaration (static first), for a strictly conforming program, but that implementations were free to accept "extern" first and "static" later (static wins) as an extension, much like the UNIX common model.

Plauser represented that his proposed edits (87-153#8) were consistent with static wins, and consistent with Prodehl's and Nolan's requests. Nolan asked that statics not be referenced before their declared type is completed -- Plauser proposed that statics be complete at declaration. An implementation could tolerate incomplete statics as an extension, to satisfy Prodehl. Plauser also proposed that statics be initializable after the first declaration, which Nolan was willing to accept.

Plauser also requested (Issue #1) that an external declaration with no keyword merely be taken as a tentative definition, not mandate external linkage as the draft now states. Nolan objected to this change. There was considerable discussion.

Plauser also requested (Issue #2) that block level function declarations have either no storage class or the keyword "extern," so that "static" at block level would not suggest internal linkage. Again there was considerable discussion.

Plauser expressed dismay, in heated tones, that the extensive edits he had developed to clarify outstanding issues would be lost, due to quibbling that should have been earlier resolved. In deference to this tantrum, Brodie elected to reboot the discussion and take a fresh start.

8. Prepared Papers

Plauser presented his proposal (87-153#8, Issue #3) that the declaration of objects with internal linkage and incomplete type be disallowed.

Straw vote:

lots can't declare incomplete statics

2 can't use incomplete statics until complete

Plauser presented his proposal (Issue #4) that objects with internal linkage be initializable after the first declaration. There was no objection.

Discussion then returned to whether tentative definitions also had external linkage (Issue #1). There was a brief discussion.

Straw vote:

6 "int x;" shouldn't mandate external linkage
lots status quo

Returning to the meaning of "static int f();" at block level, there was additional discussion. It was agreed that status quo is murky on this topic.

Straw vote:

21 make "{static int f();" invalid
14 say it's valid

Since there was no clear 2/3 majority for change, there was further discussion.

Straw vote:

30 make "{static int f();" undefined
7 no

Prosser objected to a proposed edit (87-153#8) that would delete the constraint on redeclaration of entities with no linkage at block level. Plauger observed that there was no such constraint at file level covering typedefs, so it was silly to constrain them just at block level. There was additional discussion.

Straw vote:

1 delete redeclaration constraint at block level
lots no

Several additional minor edits were proposed to 87-153#8.

Straw vote:

lots accept 87-153#8 on linkage, as modified
0 no

Prosser/Colligan

"Move we accept 87-153#8 as amended, clarifying linkage."

Motion carried, lots/0/0.

Gwyn presented proposals (87-153#7, 87-192) to add support for Kanji and other large character sets to C. Plauger gave an overview of the features he proposed (87-153#7). There was some discussion, and a few changes were suggested.

Straw vote:

lots accept 87-153#7 on multi-byte support, as amended
0 no

Meloy requested that the formal vote be deferred until the Committee had time to study commentary from /usr/group and the Japanese (87-192).

Plauger presented a number of edits (87-153#9) to the description of types. They were designed, he said, to

distinguish more clearly between the distinct types and how they are specified. The edits also made wider use of the concept of "same type," replacing a number of other colloquialisms.

Prosser noted a substantive change that effectively permitted the indirection operator * to be applied to any pointer type, even void *. Plauger defended this as safe, so long as the pointer is never dereferenced.

Straw vote:

27 permit *p for any pointer type
3 no

Prosser noted a substantive change that disallows out of range pointer values (other than just off the end of an object) as a result of adding an integer to a pointer. The draft currently disallows only dereferencing such pointer values. Plauger observed that machines such as the 8086 cannot necessarily represent such values as intermediate steps to a valid pointer, as the draft currently implies is permissible.

Straw vote:

lots make p+i undefined if out of range
0 ok until dereferenced

9. Prepared Papers

Prosser presented proposed changes (87-142, 87-153#9, 87-168) to the discussion of const and vol types. He identified the areas of impact as: arithmetic types, pointers to qualified types, lvalue to rvalue conversion, aliasing, function arguments, function parameters, and declaration constraints.

Plauger objected to Prosser's proposal to disallow the declaration of const arrays and functions, as in:

```
typedef int *pi, ai[], fi();  
const pi pl; /* okay */  
const ai al; /* error? */  
const fi fl; /* error? */
```

Plauger felt that a const array should be the same type as an array of const, and that const functions (and functions returning const) should be left semantically undefined for local extensions. There was some discussion.

Straw vote:

5 const array is constraint error
lots const array is same as array of const

Straw vote:

6 const function is constraint error
lots undefined

Prosser walked through his proposal (87-142) in more detail. Plauger felt that the type latitude permitted in balancing conditional operator types was perhaps too great. MacDonald, Jeter, and others felt that const pointer qualifiers should be generally ignored in matching types across operators.

Straw vote:

lots accept 87-142 clarifying types
Ø no

Hudson presented his proposed wording (87-148, 87-193) describing declarators. There was some discussion of how to merge these words with those of Prosser and Plauger.

Straw vote:

lots accept 153#9 on types, as amended by Hudson & Prosser
Ø no

Plum/Prosser

"Move we accept 87-153#9 as amended by Hudson (87-148, 87-193) and Prosser (87-142, 87-168) on types."

Motion carried, lots/Ø/Ø.

10. Organization of Subgroups

The Committee divided again into subgroups to summarize points raised in member papers.

12. Presentations

Prodehl agreed to drop a request (87-160) to clarify the effect of "#include <ab/*>", with the understanding that this is undefined behavior to allow different ways of tokenization.

Crockett requested (87-145) that we change the description of the return value of fputs. The draft calls for zero return on success, nonzero on error. UNIX returns the number of characters transmitted on success, a negative value on error. Schrecker requested that EOF be assured on failure.

Straw vote:

lots fputs, puts return EOF on error, else >= 0
Ø status quo

Prosser/Colligan

"Move we say that fputs and puts return EOF for failure, >= 0 for success."

Motion carried, lots/Ø/Ø.

Crockett requested that fflush and fclose return EOF on

failure and zero on success, instead of just some nonzero value on failure. There was no objection.

Prosser/Colligan

"Move we say that fclose and fflush return EOF on failure, zero on success."

Motion carried, lots/1/0.

13. Subgroup Preparation

The Committee formed into subgroups to further process public responses.

14. Presentations

Bradbury presented a request (87-069 #1, #8) to change the grammar to more clearly define preprocessor tokens. The discussion was deferred.

Bradbury presented a request (87-069#13) to clarify the constraints on the arguments to strerror and perror, and to define strerror in terms of perror. Accepted as editorial.

MacDonald presented additional preprocessor tokenization issues. These were also deferred.

MacDonald presented a request to permit void expressions as operands of void casts. There was some discussion.

Straw vote:

- 18 permit void cast on any expression
- 8 status quo

Gwyn/Jervis

"Move we permit void casts to apply to any type expression."

Motion carried, 21/5/6.

MacDonald presented a request (87-106) that we provide finer granularity in the timer functions. There was some discussion.

Straw vote:

- 4 add sub-second info to struct tm
- lots no

Elliott presented a request (87-078#4) that we provide manifest constants giving external name length and case significance. There was much discussion.

Straw vote:

- 11 add macros giving ext name length and case
- 19 no

Brodie provided information from X3 on the disposition of the responses to public commentary. Each person making a public comment has 14 days to respond to our response, saying whether they felt the response was adequate. If that feedback comes in during the second public review period, it is treated as a public comment.

Brodie also noted that, after the standard is adopted, there must still be some method for responding to requests for interpretation. A smaller X3J11 can meet perhaps twice a year to provide this service.

Brodie also reported that X3 has no formal policy about the designation of obsolescent features.

Jervis presented a request (87-105#8) to use the precision modifier on %c in printf as a repetition count.

Straw vote:

3 use %.nc to repeat %c output
lots no

Jervis presented a request (87-105#13) that we clarify the behavior of strtok. Should an initial call, with s1 NULL, return NULL? Currently this seems to be undefined. Should strtok strip trailing separators as well as leading? This could make a difference if successive calls use different separator lists.

Straw vote:

6 strtok with s1 NULL returns NULL
7 leave undefined

Straw vote:

1 strtok should skip trailing separators
lots no

Jervis presented a request (87-126#5) that we clarify the effect of "#include <header>name>". There was general agreement that this is simply undefined behavior.

Jervis presented a request (87-126#6) that we define the grouping properties of the ## paste operator. Otherwise, the sequence

0 ## x ## 4

could group either as 0x and 4 or as 0 and x4, possibly with different behavior.

Straw vote:

0 specify grouping of ##
lots leave unspecified

Jervis presented a request (87-126#9) that we move the # and

operators/separators from 3.1.5 to 3.8, since they are used only by the preprocessor. There was some discussion.

Straw vote:

3 move # and ## description to preprocessor
6 no

Jervis presented a request (87-124#4) yet again that we permit equality comparisons for structures. All of the old arguments on both sides were rehashed.

Straw vote:

10 permit struct compares
14 no

Jervis presented a request (87-138#1) that we give meaning to a conditional with a missing middle operand, so that (x?:y) is equivalent to ((T=x)?T:y). There was some support for this proposal, but some concern that it was too late to consider such changes. It was agreed that "it's too late" is a weak argument.

Straw votw:

15 permit x?:y
11 no

This was not considered sufficient support for a motion.

Jervis presented a request (87-169) that we make

p = "string"

permissible for p a pointer to any character type. There was much discussion of whether we should relax type checking in general or for string literals in particular.

Straw vote:

16 permit some relaxation of type rules
10 no

Despite this vote, an additional straw vote was requested.

Straw vote:

16 relax type rules for string literals
10 no

Colligan presented a request (87-047 #16, #17, #18) that we impose tighter constraints on the structure of switch bodies, such as requiring the body be a block and/or disallowing case labels within contained structures. Several uses for bizarre switch statements were pointed out.

Straw vote:

1 disallow case labels in contained structures
lots 0

Colligan presented a request (87-068#42) that we clarify the relative binding of the conditional and comma operators, as in

```
f(a, b ? c, d : e, f);
```

(Here (c,d) is the middle operand of the conditional.)
Accepted as editorial.

Colligan presented a request (87-068#37) that we clarify the effect of the #line directive. It was agreed that the only defined effect of this directive is on the result of the `__LINE__` and `__FILE__` macros. Accepted as editorial.

Bradley presented a request (87-029, sec. 4.2) that we clarify whether an implementation can use target environment arithmetic in the preprocessor. It was agreed that it can.
Accepted as editorial.

Bradley presented a request (87-029, sec. 6.9) that we clarify the effect of "#if a/0". Brodie recommended a more specific proposal, to focus discussion.

Bradley also presented a request that we add udiv and uldiv functions, analogous to div and ldiv. There was some discussion.

Straw vote:

1 add udiv, uldiv
lots no

15. Subgroup Preparation

The Committee broke into subgroups to address remaining public review issues.

16. Presentations

Hudson presented a request (87-086) that we clarify the type balancing in conditionals between null pointer constants, void * pointers, and other object pointers. Plauger insisted that the current rules are correct, but need to be stated more clearly. Proper behavior is that any pointer type dominates a null pointer constant; otherwise void * dominates any object pointer type.

Hudson presented a request (87-086##19) that we clarify when register declarations are "effective." He proposed that we strike the sentence requiring an implementation to define how registers are allocated. There was some discussion.

Straw vote:

11 strike implementation definition of registers
20 no

Plauger suggested that we clarify the meaning of

"implementation defined" in the Rationale.

Elliott presented a request (87-054, p. 8) that we permit a trailing comma in an enum constant list.

Straw vote:

- 14 allow trailing comma in enum list
- 15 no

Elliott presented a request (87-054, p. 6, and 87-187) that we clarify the limitations on constant expressions that may be used to initialize integers and pointers. There was general support for the old K&R limitation that pointer initializers be limited to a static address plus or minus a constant integer value. Plauger also urged that integer casts with pointer operands be disallowed. This was generally accepted.

Straw vote:

- lots disallow integer casts on pointers in inits
- 1 no

Meloy/Colligan

"Move we accept 87-187 as amended, restricting initializers."

Motion carried, lots/1/3.

Weidenhofer, no -- linkers have been doing this for years, why step backwards?

Elliott raised the same issue with bit field initializers. He agreed that the previous motion covered this issue.

Prodehl reintroduced an earlier request (87-069 #1, #8) that we revise the preprocessor token grammar. The discussion revealed considerable confusion over the nature of the proposal, so it was again deferred.

Colligan presented a request (87-135) that we clarify the constraints on search paths for nested include files. Plauger observed that the wording was designed to gloss over differences between UNIX preprocessors, since the concept of a directory was outside the scope of the C standard.

Straw vote:

- lots just say include search is implementation defined
- 0 status quo

Colligan/Jervis

"Move we change 3.8.2 on #include search to say: 'The named source file is searched for in an implementation defined manner. If this capability is not supported, or if the search fails, ...'."

Colligan presented a request (87-068#42) that we clarify the relative binding of the conditional and comma operators, as in

```
f(a, b ? c, d : e, f);
```

(Here (c,d) is the middle operand of the conditional.)
Accepted as editorial.

Colligan presented a request (87-068#37) that we clarify the effect of the #line directive. It was agreed that the only defined effect of this directive is on the result of the `__LINE__` and `__FILE__` macros. Accepted as editorial.

Bradley presented a request (87-029, sec. 4.2) that we clarify whether an implementation can use target environment arithmetic in the preprocessor. It was agreed that it can. Accepted as editorial.

Bradley presented a request (87-029, sec. 6.9) that we clarify the effect of "#if a/0". Brodie recommended a more specific proposal, to focus discussion.

Bradley also presented a request that we add udiv and uldiv functions, analogous to div and ldiv. There was some discussion.

Straw vote:

1 add udiv, uldiv
lots no

15. Subgroup Preparation

The Committee broke into subgroups to address remaining public review issues.

16. Presentations

Hudson presented a request (87-086) that we clarify the type balancing in conditionals between null pointer constants, void * pointers, and other object pointers. Plauger insisted that the current rules are correct, but need to be stated more clearly. Proper behavior is that any pointer type dominates a null pointer constant; otherwise void * dominates any object pointer type.

Hudson presented a request (87-086##19) that we clarify when register declarations are "effective." He proposed that we strike the sentence requiring an implementation to define how registers are allocated. There was some discussion.

Straw vote:

11 strike implementation definition of registers
20 no

Plauger suggested that we clarify the meaning of

to require type checking across modules by means of a "postc" postprocessing phase. Part of his proposal was to lessen the need for prototypes and give additional credence to the older function declaration formats.

Straw vote:

1 remove obsolescence of f() declarations
lots no

Straw vote:

4 require type checking across translation units
lots no

Plauser presented several responses (87-192) to his earlier proposal on multi-byte character support. He reported general acceptance, by /usr/group and the Japanese, to his additions. The Japanese also requested several additional features, some of which Plauser also supported.

Straw vote:

27 add string versions of multi-byte to wide-char fns
1 no

Straw vote:

13 add %ls to I/O wide-char strings
9 no

Straw vote:

24 add some form of wide-char string literals
3 no

Straw vote:

26 permit wide-char string literals in initializers
3 no

** Plauser will draft further multi-byte proposals.

Plauser/Gwyn

"Move we accept 87-153#7 as amended, on multi-byte support."

Motion carried, lots/1/6.

Jeter, no -- need more time to consider direction.

Brodie asked all members to state any issues that would currently keep them from voting out the draft.

Bradbury needs resolution of memcmp issues.

Bradbury needs clarification of stdargs semantics.

Nolan needs changes to setlocale.

Nolan will object to wide-char strings of the form "...".L.

Colligan needs adoption of portable header file names.

Colligan needs better ways to group floating operands.

MacDonald needs limitations on overlapping function parameters.

Khushf needs a softer limit on nested parentheses.

Jervis needs clarified semantics for volatile.
Meloy needs clarification of setlocale vs. isspace and isdigit.
Elliott needs to see multi-byte support completed.
Gwyn needs looser requirements on va_start and va_end.
Plauser needs a list of macro types and header contents.

17. Subgroup Preparation

The Committee broke into subgroups yet again, because it seemed like a good idea at the time.

18. Presentations

Nolan presented a proposal (87-162) for changing setlocale so that arbitrary locales can be saved and restored. He suggested breaking setlocale into set, get, and save functions, and providing one level of push and pop for efficient stacking. Arbitrary locale information would be stored in a structure.

Prosser presented an alternative proposal (87-167) which requires that setlocale(LC_ALL, NULL) generate whatever string is necessary to completely restore the locale later. Prosser was unwilling to accept Nolan's proposal, but Nolan reluctantly admitted he could accept Prosser's. The subsequent discussion strongly favored Prosser's proposal, so Nolan withdrew his proposal. Nolan will submit his proposal in the form of a public comment.

Straw vote:

18 require setlocale(LC_ALL, NULL) to save composite
locale
2 status quo

Prosser/Meloy

"Move we accept 87-167, specifying changes in setlocale."

Motion carried, 22/2/10.

Nolan, no -- it's an abominable kludge that is exceedingly difficult to implement

MacDonald presented a request (87-154#3) that we require constant parameters passed by reference not to overlap writable parameters, to clarify aliasing rules and to open the door for vectorization of loops in C. There was much discussion, which revealed considerable support for guarantees that would simplify introducing parallelism in C. It was generally agreed, however, that MacDonald's wording was not acceptable standards language. Further work on this subject was strongly encouraged.

19. Summary of Decisions Reached

Plauser read through these minutes and gave a summary of all

motions passed during the meeting.

20. Action Items

Plauger read through these minutes and gave a summary of all action items committed to by members during the meeting. These are marked in these minutes by a ** in the left margin.

21. Future Meetings

Plauger suggested that the Jul 88 meeting be delayed to Aug 88, should a third public review be needed.

Straw vote:

10 move 11-15 Jul 88 meeting to 15-19 Aug 88
8 no

Straw revote:

13 move it
7 no

Brodie tentatively agreed to host a Dec 88 meeting in Phoenix AZ.

The current meeting schedule is now:

07-11 Dec 87	Austin TX	Tymlabs
18-22 Apr 88	Nashua NH	Honeywell
15-19 Aug 88	Cupertino CA	Borland/Tandem/H-P
12-16 Dec 88	Phoenix AZ	Brodie

22. Other Business

22.1 Review of Edits

Brodie asked if there were any objections to including the various edits proposed in papers and public review comments. Several objections were noted, for later resolution.

Gwyn asked for guidance on how to advise POSIX to deal with differences between their standard and X3J11. He told them to include the file "posix.h" before any Standard C includes, so these headers could conditionally provide either a pure C environment or a POSIX extended environment. After some discussion, the Committee endorsed his approach.

22.2 Future Agenda Items

Brodie accepted requests for agenda time at the next meeting to deal with several open issues.

22.3 Preparation of Response Document

Plum and Gwyn agreed to meet before the next meeting of X3J11 and produce a response document that could be mailed out with the revised draft standard. They were empowered to answer

any unaddressed issues the same way that subcommittees have done to date. Plum asked that the Committee endeavor to deal with the remaining public review issues at this meeting.

Straw vote:

14 focus on letter issues now

9 focus on member issues

Weidenhofer suggested that the issues common to both be addressed first.

23. Presentations

Bradbury presented a request (87-049#8, 87-165) that we clarify the handling of #pragmas that are unrecognized. It was agreed that they must be accepted, but that a common warning was in order.

Straw vote:

lots list common warning on unrecognized pragmas

0 no

Bradbury/Jaeschke

"Move we add unrecognized pragmas to common warnings."

Motion carried, lots/0/0.

Bradbury reraised the issue (87-181) of the type of va_list.

Bradbury/Elliott

"Move we say that va_list is any type, not just array type."

Motion carried, lots/5/2.

MacDonald presented a request (87-068#50) that we remove the special requirement that fgetc and fputc not be a macro. It was observed that the old reasons for this constraint no longer apply.

Straw vote:

lots fgetc and fputc may be a macro

4 no

MacDonald/Jervis

"Move we remove restriction that fgetc and fputc be functions only."

Motion carried, lots/4/5.

Meissner, no -- it's a needless restriction.

Peyton, no -- for historical reasons.

MacDonald presented a request (87-068#51) that the draft

clarify why there are two seeking mechanisms, fgetpos/fsetpos and ftell/fseek. It was agreed that the Rationale provides sufficient explanation.

Elliott presented a request (87-054, p. 14) that raise(SIG_FPE) call a handler in such a way that it can return. The behavior is currently undefined for any invocation of a handler for SIG_FPE. Several members pointed out that such a restriction was indeed necessary.

Straw vote:

2 say raise(SIG_FPE) handler may return
lots no

Elliott presented a request (87-054, p. 13) that functions containing static buffers (such as strtok, asctime, etc.) not have their buffers destroyed by undocumented calls from other library functions.

Elliott/Colligan

"Move we say that calling other library functions won't alter the static storage of library functions in undocumented ways."

Motion carried, lots/0/3.

Weidenhofer, abstain -- trusts Prosser to get words right, but this is scary.

Prodehl, abstain -- not sure of all the affected functions.

Bradley, abstain -- potentially non-trivial, uncomfortable about voting on the fly.

Plum observed that all public review issues have now been addressed by the Committee.

Khushf requested (87-185) that the min/max level for parenthesis nesting be lowered to 32 from 127. Plauger suggested a prime number such as 23 (which is $\text{ceil}(\sqrt{509})$).

Straw vote:

lots lower nesting to 32
1 leave it at 127

Khushf/Bradbury

"Move we lower the min/max limit for parenthesis nesting to 32 from 127."

Motion carried, lots/1/0.

Bradley, no -- too few for machine generated programs.

MacDonald reraised the problem of vectorizing C. Plauger suggested that the current notion of constant pointers was

probably too weak. Instead of just promising that const lvalues will not themselves be used to alter memory, he felt that they also promise that memory will not be changed underfoot. In other words, an access to a data object via a const lvalue effectively pins down values stored in that memory.

If we say that access to const lvalues may be advanced to before earlier sequence points, then MacDonald has the latitude he needs to vectorize. Plauger proposed that such access not be advanced to a point earlier than the activation of the function containing the const lvalue access. The constraint would be that a function activation that accesses const lvalues and that alters the stored values (via other lvalues) has undefined behavior. A function that unwittingly writes over const parameters has permission to get a variety of wrong answers.

There was some discussion of this viewpoint, and a general agreement that much more education was needed before the Committee could reach a decision.

** Plauger agreed to write a paper on the aliasing of const lvalues.

Jervis presented a request that we clarify what we mean when we say "accessing a volatile object" is a side-effect. It was generally agreed that we cannot mandate the nature or number of touches involved in an access, but there was strong sentiment that an expression such as "i;" touch a volatile i at least once.

Jervis proposed that we say under 3.2.2.1 that converting an lvalue to an rvalue accesses the value stored in an implementation defined manner. Plauger objected strongly to any implied promise that an access touch the object at least once, since we can say so little about the nature of touches anyway.

Straw vote:

17 say lvalue conversion accesses stored value
13 no

Straw vote:

lots say access to volatile is implementation defined
2 no

Hudson/Colligan

"Move we say that access to a volatile object is implementation defined."

Motion carried, lots/2/2.

Brodie dealt with several administrative matters.

** Jervis agreed tentatively to do the mailing.

Weidenhofer, Schubert, and Osten agreed to serve as (tentative) backups for the mailing. Khushf urged members to come to the Dec 87 meeting knowing whether they can commit to doing the next mailing.

Brodie asked for any objections to including the uncontested edits in the next draft. There were none. Prosser and Hudson agreed to provide diff marks against the most recent drafts this time (87-140, 87-147).

** Elliott, Hudson, Nolan, Plauger, Prodehl, and Williams will review the draft edits made by Prosser.

Brodie asked again for a list of issues that will prevent anyone from voting out the draft at the next meeting. By head count, these are:

- (1) memcmp issues
- (3) honoring grouping
- (3) portable header file names
- (5) overlapping parameters
- (2) semantics of volatiles
- (1) setlocale effect on is*
- (5) completing multi-byte support
- (1) stdargs semantics
- (2) classification of macros

Colligan proposed (87-125, 87-195) a set of header file names that should be supported on all implementations. These consist of six letters, a dot, and a single letter. Case need not be significant.

Colligan/Elliott

"Move we define portable header file names as in 87-195."

Motion carried, lots/0/0.

25. Adjournment

Nolan/

"Move we adjourn."

Motion carried, lots/0/0.

The meeting adjourned on Friday, 18 Sep 87, at 12:10 p.m.

Attachments:

Attendance Sheets
Amended Agenda

W614/N019 CONT'D

X3J11/87-149R

18 Sep 87
Project 381-D

REVISED AGENDA
X3J11 Standards Committee Meeting

14-18 Sep 87
Sheraton Tara Hotel
1657 Worcester Road
Framingham MA 01701
(17) 879-7200

14 Sep -- 9:00 - 12:00 1:30 - 5:00
15 Sep -- 8:30 - 12:00 2:00 - 5:30
16 Sep -- 8:30 - 12:00 2:00 - 5:30
17 Sep -- 8:30 - 12:00 2:00 - 5:30
18 Sep -- 8:30 - 12:00 noon

Monday, 14 Sep

1. Opening Activities (Brodie)
 - 1.1 Opening Comments -- Goals and Purposes of Eighteenth Meeting of X3J11
 - 1.2 Housekeeping
 - 1.3 Approval of Previous Minutes (87-129)
 - 1.4 Approval of Agenda (87-149)
 - 1.5 Introduction of New Participants
 - 1.6 Distribution of Information on Next X3J11 Meeting
 - 1.7 Procedures for this Meeting
 - 1.8 Distribution of Any New Documents
 - 1.9 Review of Action Items from Previous Meeting
 - 1.10 X3 Notices
 - 1.11 Roll Call
2. Reports on Liaison Activities
 - 2.1 IEEE 1003 Standard Report
 - 2.2 ISO Report (Plauser)
 - 2.3 SQL Report (Bradbury)
 - 2.4 X/OPEN Report
 - 2.5 Other Liaison Activities (Brodie)
3. Report on Current Status (Brodie)
4. Report of the Redactors (Prosser and Hudson)
5. Approval of Current Draft (87-140)
6. Prepared Papers
7. Prepared Papers

Tuesday, 15 Sep

8. Prepared Papers
9. Prepared Papers
10. Organization of Subgroups
11. Subgroup Preparation of Issues
12. Subgroup Presentations

Wednesday, 16 Sep

13. Subgroup Preparation of Issues
14. Subgroup Presentations

Thursday, 17 Sep

15. Subgroup Preparation of Issues
16. Subgroup Presentations
17. Subgroup Presentations
18. Prepared Papers and Deferred Items

Friday, 18 Sep

19. Summary of Decisions Reached (Plauger)
20. Action Items for Next Meeting (Plauger)
21. Future X3J11 Meeting Schedule (Brodie)
22. Other Business (Brodie)
 - 22.1 Review of Edits
 - 22.2 Future Agenda Items
23. Presentations
24. Preparation of Next Draft
25. Adjournment (Brodie)