C/C++ Linux Development with Eclipse

FSOSS 2011

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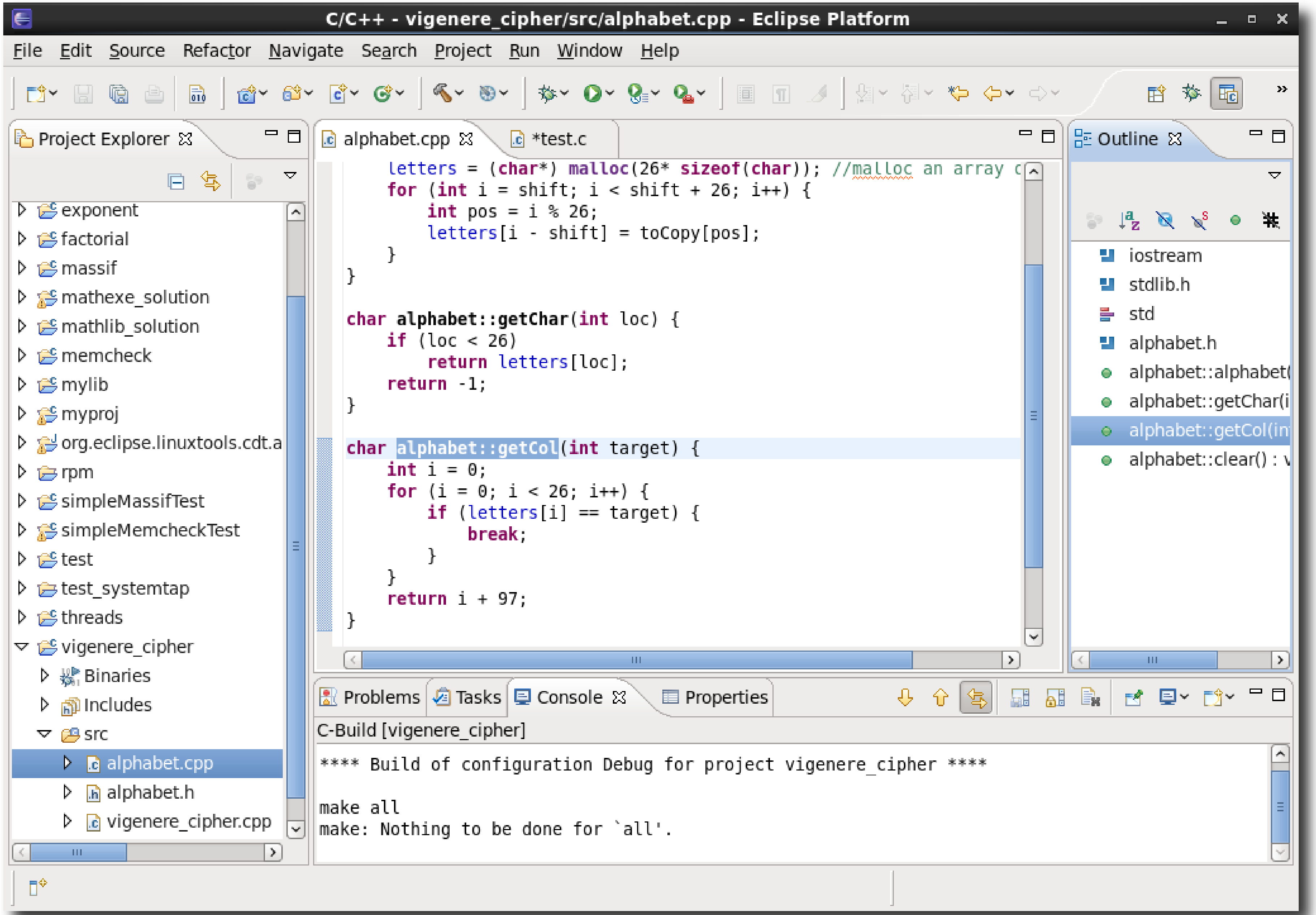
Red Hat

Development

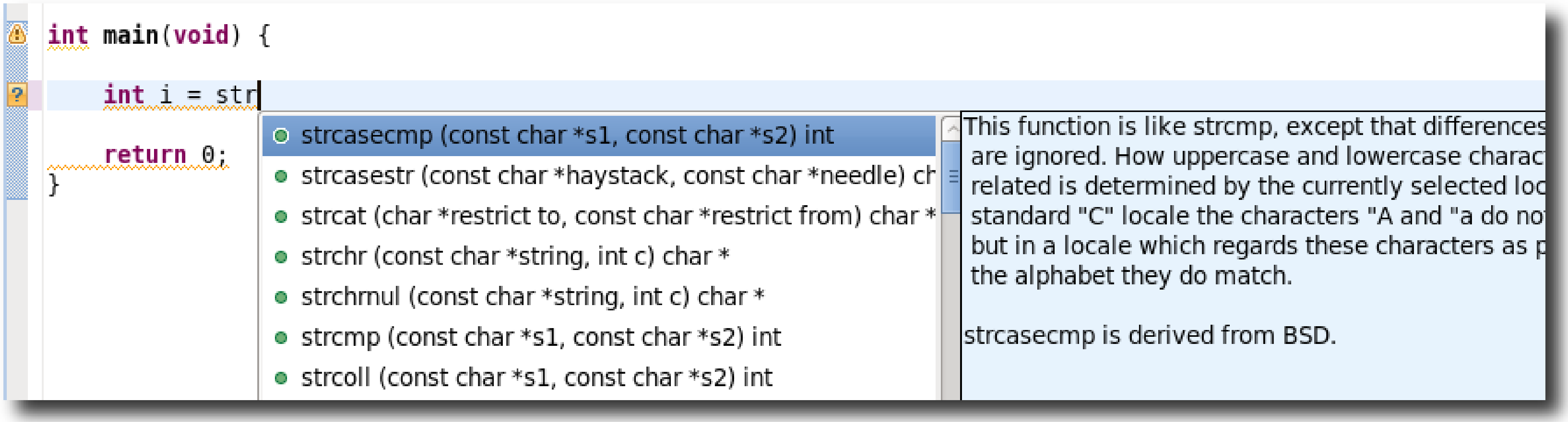
- Editing
- Building
- Debugging
- Issue tracking
- Profiling



```
    letters = (char*) malloc(26* sizeof(char)); //malloc an array c
    for (int i = shift; i < shift + 26; i++) {
        int pos = i % 26;
        letters[i - shift] = toCopy[pos];
    }
}

char alphabet::getChar(int loc) {
    if (loc < 26)
        return letters[loc];
    return -1;
}

char alphabet::getCol(int target) {
    int i = 0;
    for (i = 0; i < 26; i++) {
        if (letters[i] == target) {
            break;
        }
    }
    return i + 97;
}
```

```
**** Build of configuration Debug for project vigenere_cipher ****

make all
make: Nothing to be done for `all'.
```

Edit :: Code Completion



```
int main(void) {

    int i = str

    return 0;
}
```

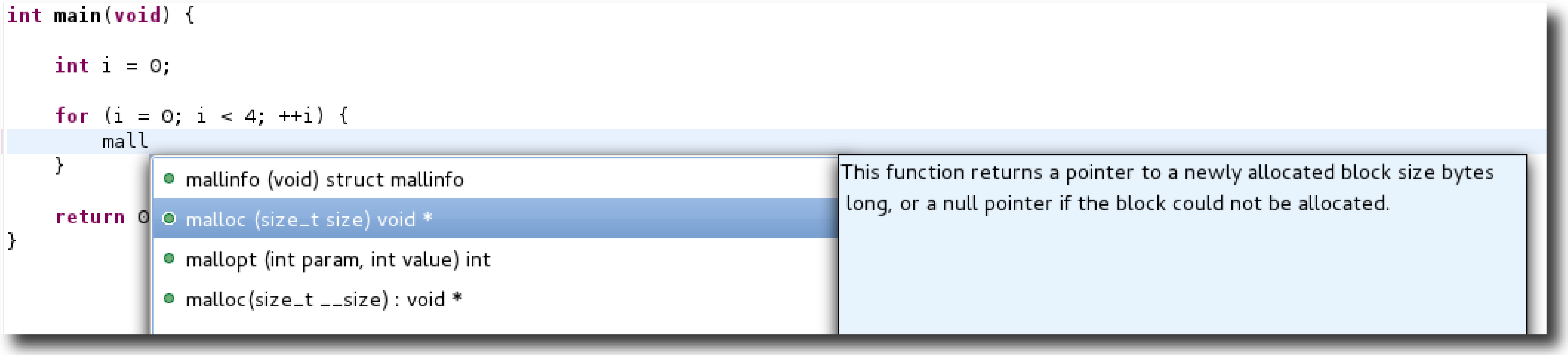
- strcasecmp (const char *s1, const char *s2) int
- strcasestr (const char *haystack, const char *needle) ch
- strcat (char *restrict to, const char *restrict from) char *
- strchr (const char *string, int c) char *
- strchrnul (const char *string, int c) char *
- strcmp (const char *s1, const char *s2) int
- strcoll (const char *s1, const char *s2) int

This function is like strcmp, except that differences
are ignored. How uppercase and lowercase charac
related is determined by the currently selected loc
standard "C" locale the characters "A and "a do no
but in a locale which regards these characters as p
the alphabet they do match.

strcasecmp is derived from BSD.

Ctrl-<Spacebar>

Edit :: Code Completion :: Libraries

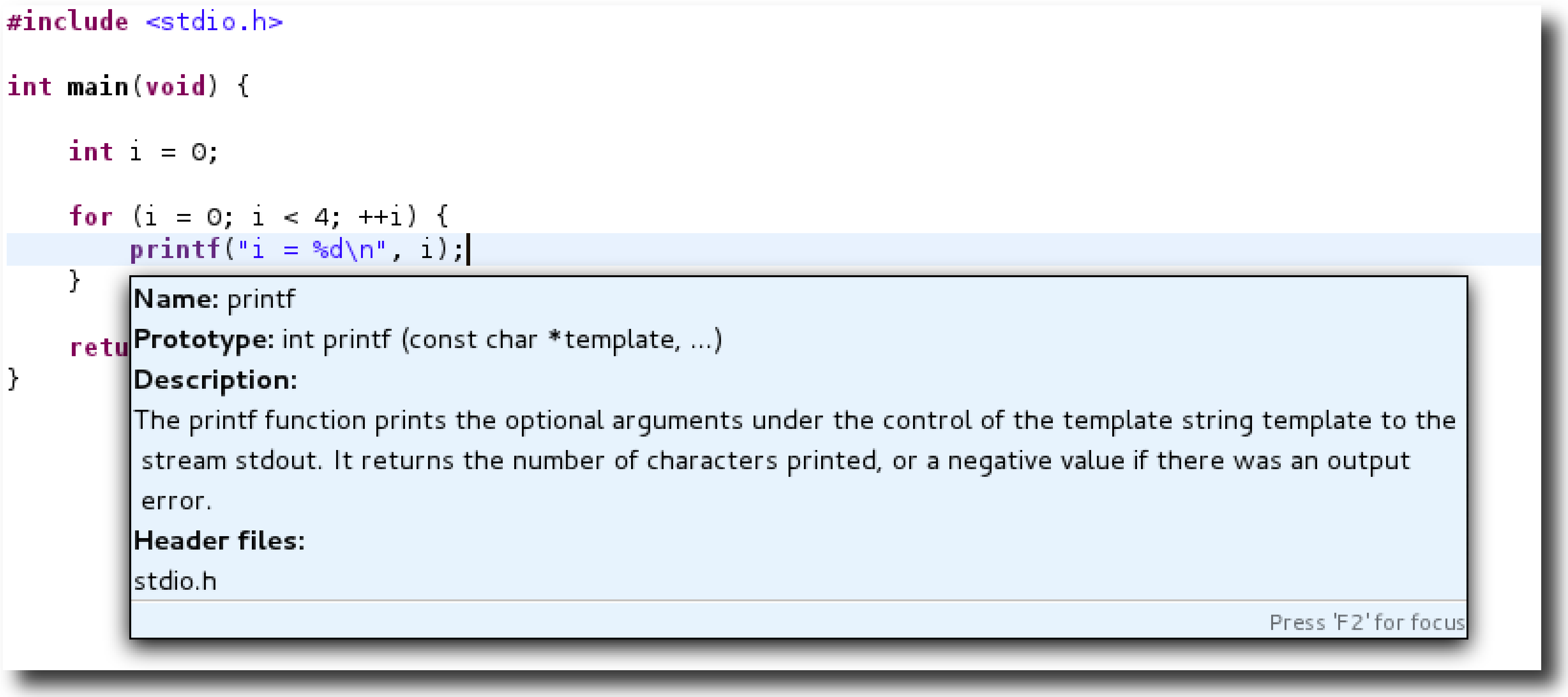


```
int main(void) {

    int i = 0;

    for (i = 0; i < 4; ++i) {
        mall
    }

    return 0
}
```

mallinfo (void) struct mallinfo
malloc (size_t size) void *
mallopt (int param, int value) int
malloc(size_t __size) : void *

This function returns a pointer to a newly allocated block size bytes long, or a null pointer if the block could not be allocated.

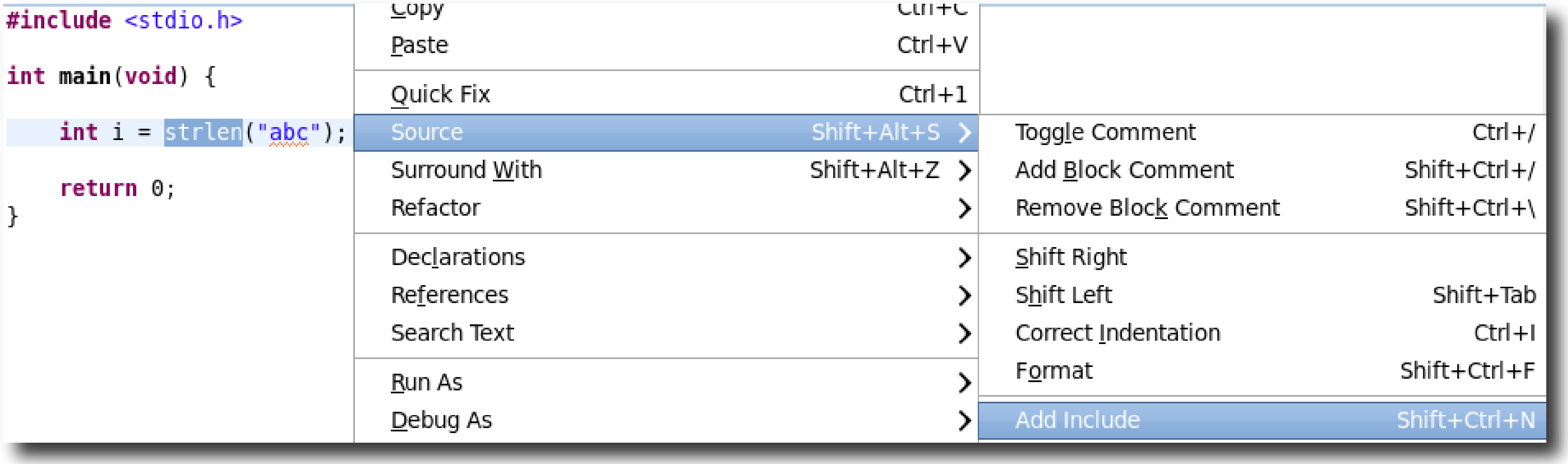
Edit :: Function documentation



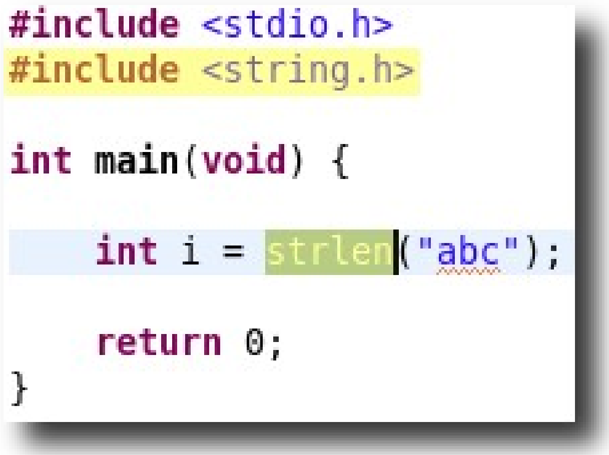
```
#include <stdio.h>

int main(void) {

    int i = 0;

    for (i = 0; i < 4; ++i) {
        printf("i = %d\n", i);
    }

    retu
}
```

Name: printf
Prototype: int printf (const char *template, ...)
Description:
The printf function prints the optional arguments under the control of the template string template to the stream stdout. It returns the number of characters printed, or a negative value if there was an output error.
Header files:
stdio.h

Edit :: Add #include

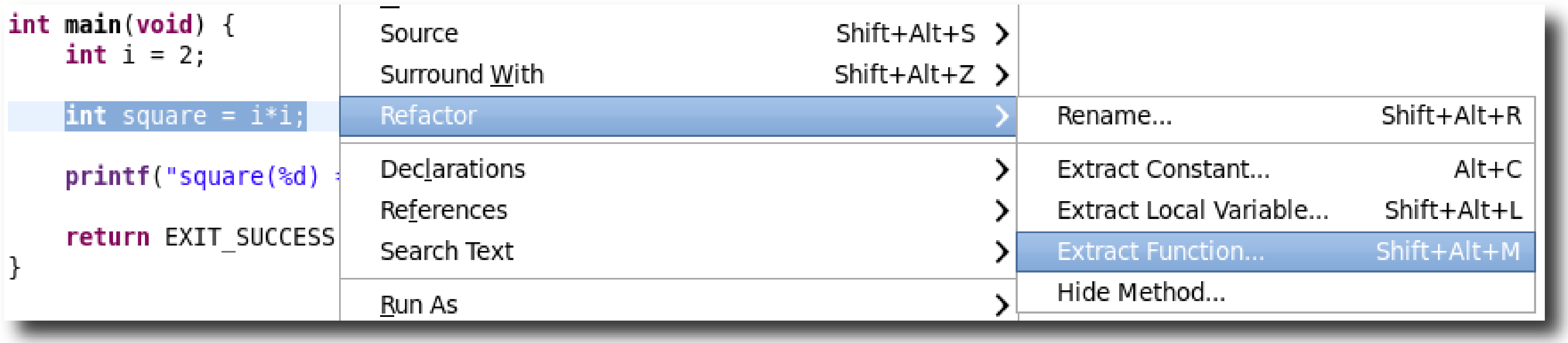


```
#include <stdio.h>

int main(void) {

    int i = strlen("abc");

    return 0;
}
```



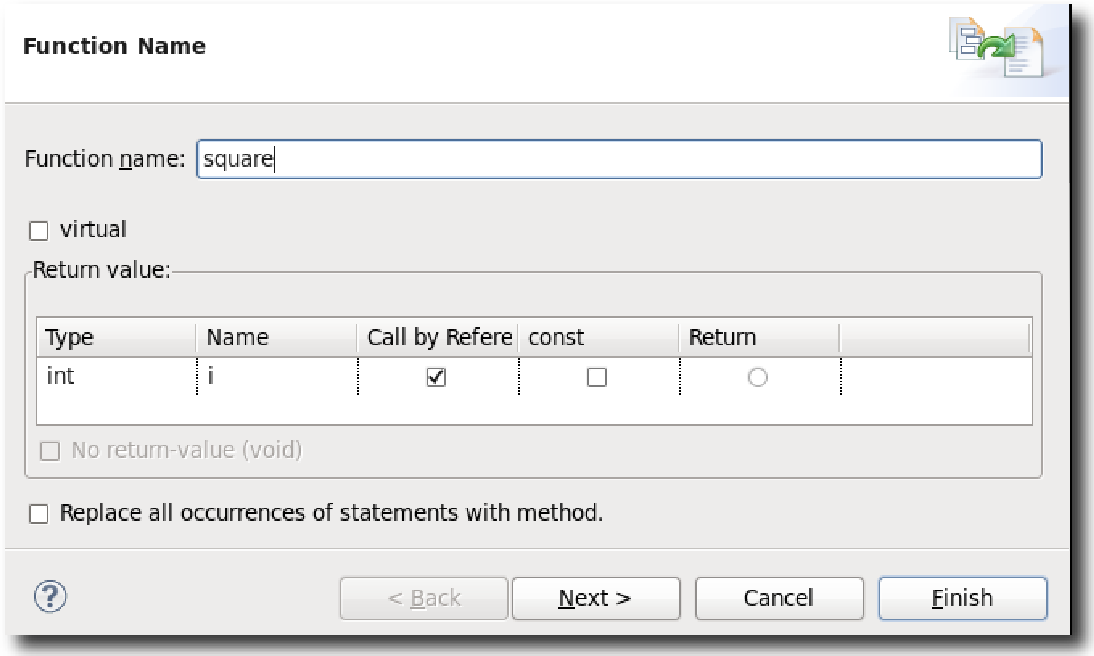
```
#include <stdio.h>
#include <string.h>

int main(void) {

    int i = strlen("abc");

    return 0;
}
```

Edit :: Refactoring :: Extract Function



```
int main(void) {
    int i = 2;

    int square = i*i;

    printf("square(%d) =

    return EXIT_SUCCESS
}
```

Source Shift+Alt+S
Surround With Shift+Alt+Z
Refactor
Declarations
References
Search Text
Run As
Rename... Shift+Alt+R
Extract Constant... Alt+C
Extract Local Variable... Shift+Alt+L
Extract Function... Shift+Alt+M
Hide Method...



Function Name

Function name: square

☐ virtual

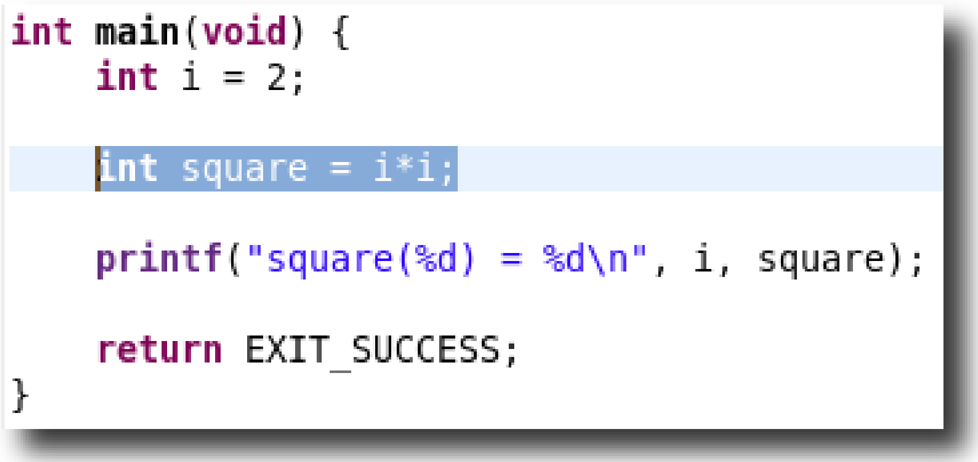
Return value:

Type	Name	Call by Refere	const	Return
int	i	☑	☐	○

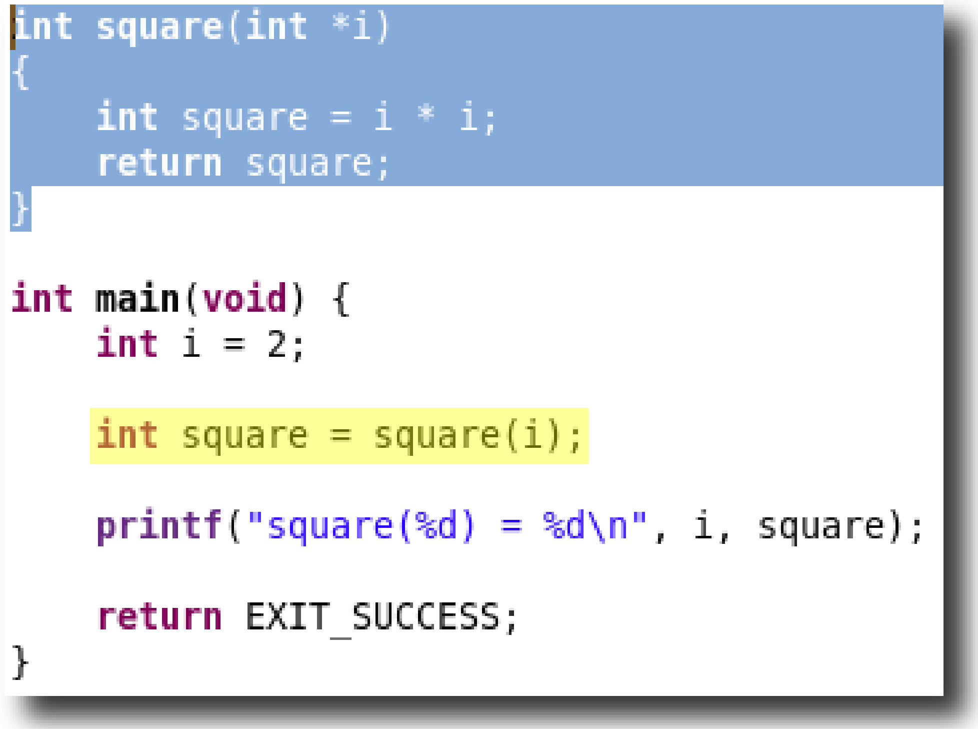
☐ No return-value (void)

☐ Replace all occurrences of statements with method.

Edit :: Refactoring :: Extract Function

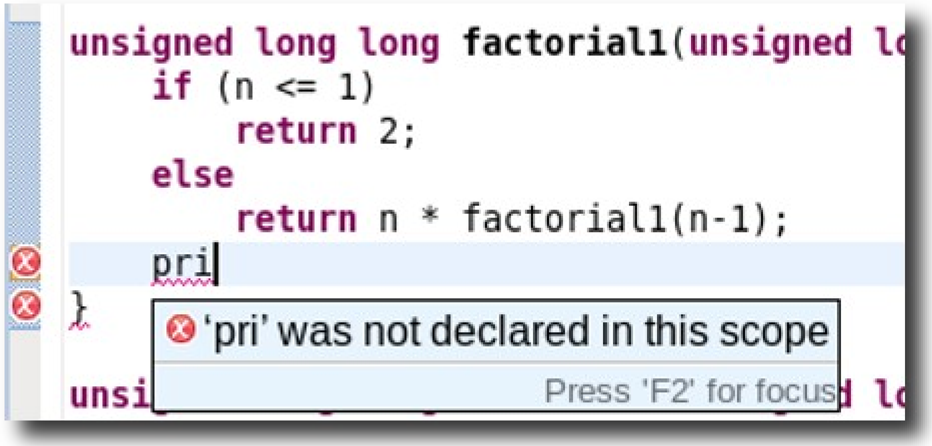


```
int main(void) {
    int i = 2;

    int square = i*i;

    printf("square(%d) = %d\n", i, square);

    return EXIT_SUCCESS;
}
```



```
int square(int *i)
{
    int square = i * i;
    return square;
}

int main(void) {
    int i = 2;

    int square = square(i);

    printf("square(%d) = %d\n", i, square);

    return EXIT_SUCCESS;
}
```

Edit :: Error Highlighting



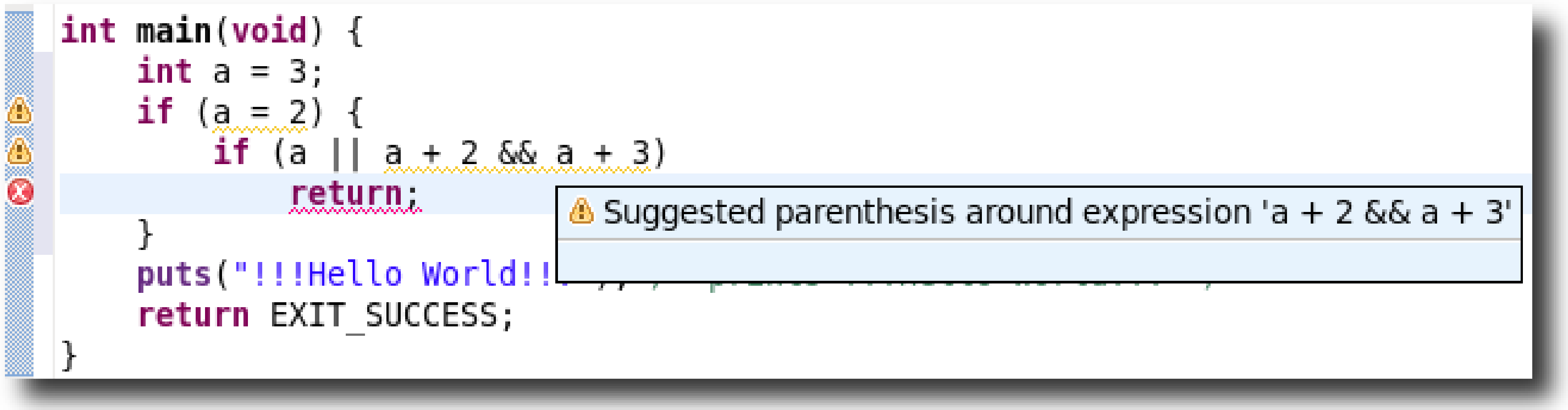
```
unsigned long long factorial1(unsigned lo
    if (n <= 1)
        return 2;
    else
        return n * factorial1(n-1);
    pri
}

unsi
```

'pri' was not declared in this scope

Press 'F2' for focus

redhat.

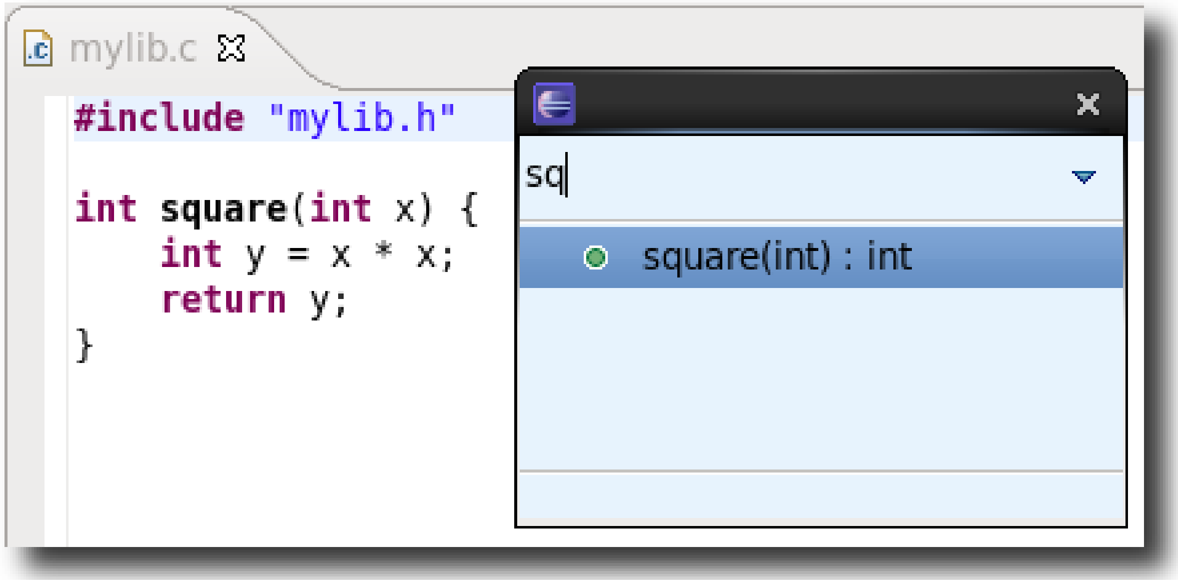
Edit :: Static Analysis :: C/C++



```
int main(void) {
    int a = 3;
    if (a = 2) {
        if (a || a + 2 && a + 3)
            return;
    }
    puts("!!!Hello World!!
    return EXIT_SUCCESS;
}
```

Suggested parenthesis around expression 'a + 2 && a + 3'

Edit :: Outline

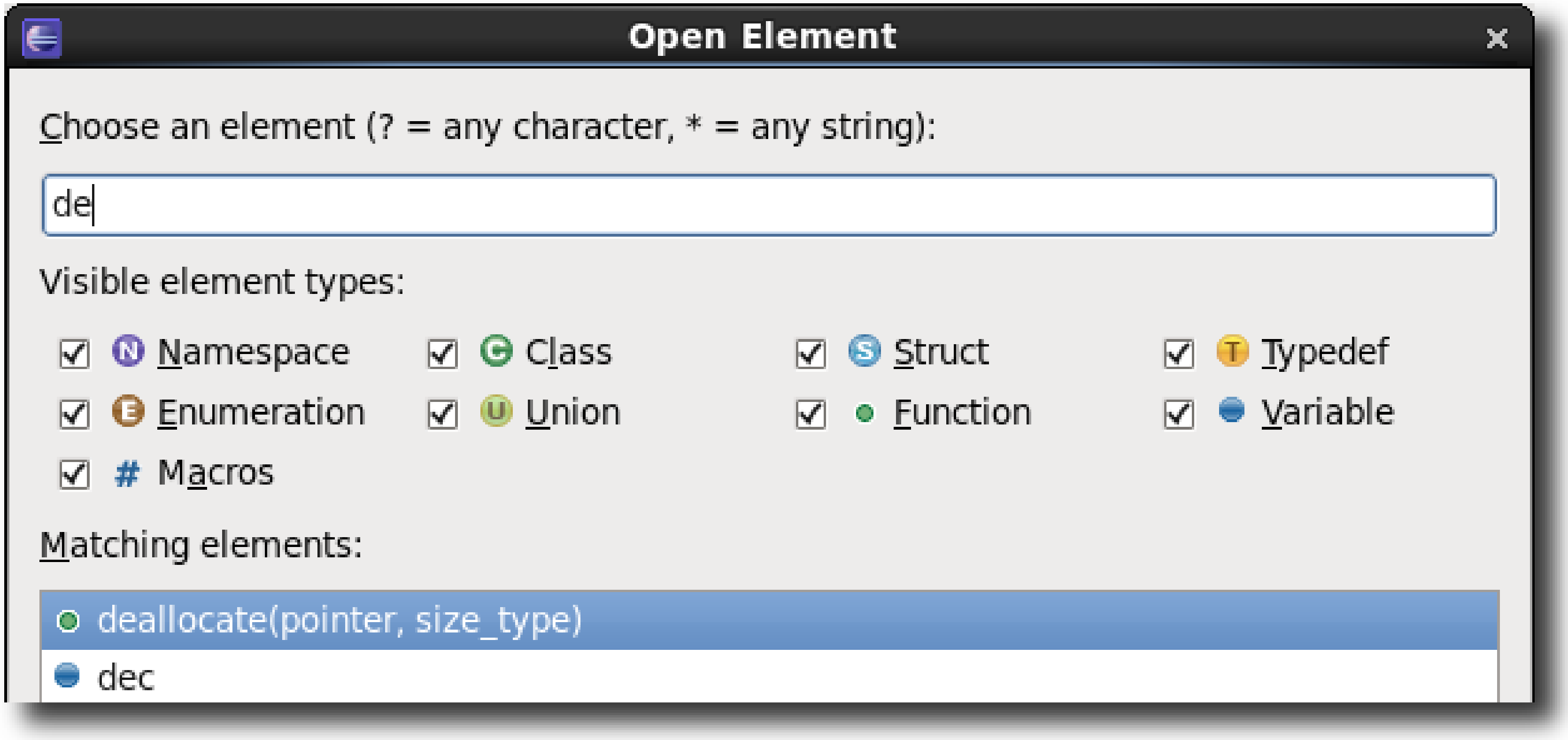


```
#include "mylib.h"

int square(int x) {
    int y = x * x;
    return y;
}
```

```
sq
● square(int) : int
```

Ctrl-o – Quick Outline
(C/C++)

Edit :: Navigation


Open Element

Choose an element (? = any character, * = any string):

de

Visible element types:

- ✓ Namespace
- ✓ Class
- ✓ Struct
- ✓ Typedef
- ✓ Enumeration
- ✓ Union
- ✓ Function
- ✓ Variable
- ✓ Macros

Matching elements:

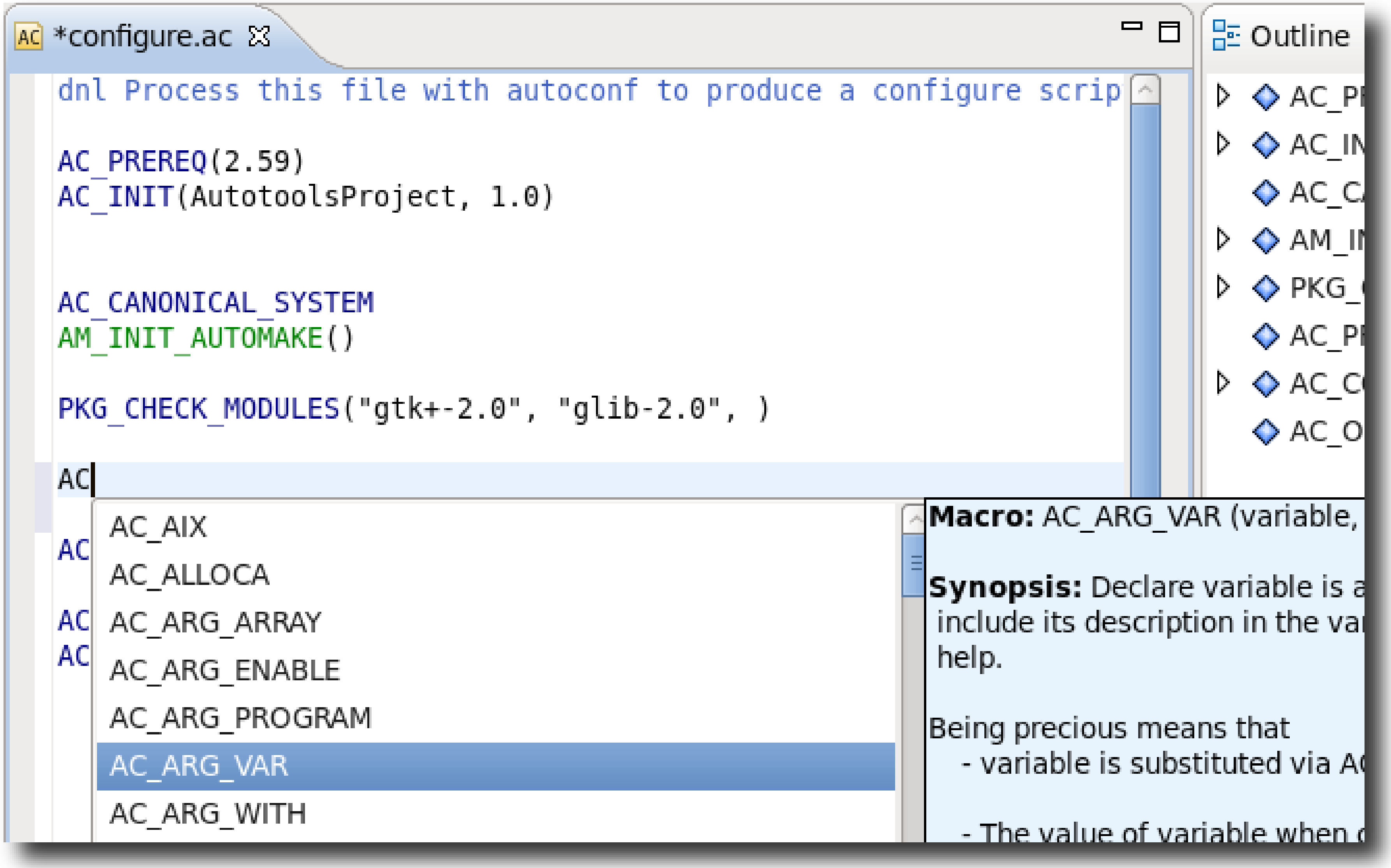
deallocate(pointer, size_type)
dec

Ctrl-Shift-t – Open Element

Compile :: Building

- gcc
- C/C++: GNU Autotools, make

Compile :: Build System :: GNU Autotools



*configure.ac

```
dnl Process this file with autoconf to produce a configure scrip

AC_PREREQ(2.59)
AC_INIT(AutotoolsProject, 1.0)


AC_CANONICAL_SYSTEM
AM_INIT_AUTOMAKE()

PKG_CHECK_MODULES("gtk+-2.0", "glib-2.0", )

AC

AC

AC
AC
```

```
AC_AIX
AC_ALLOCA
AC_ARG_ARRAY
AC_ARG_ENABLE
AC_ARG_PROGRAM
AC_ARG_VAR
AC_ARG_WITH
```

Macro: AC_ARG_VAR (variable,

Synopsis: Declare variable is a
include its description in the va
help.

Being precious means that
- variable is substituted via AC
- The value of variable when c

Outline

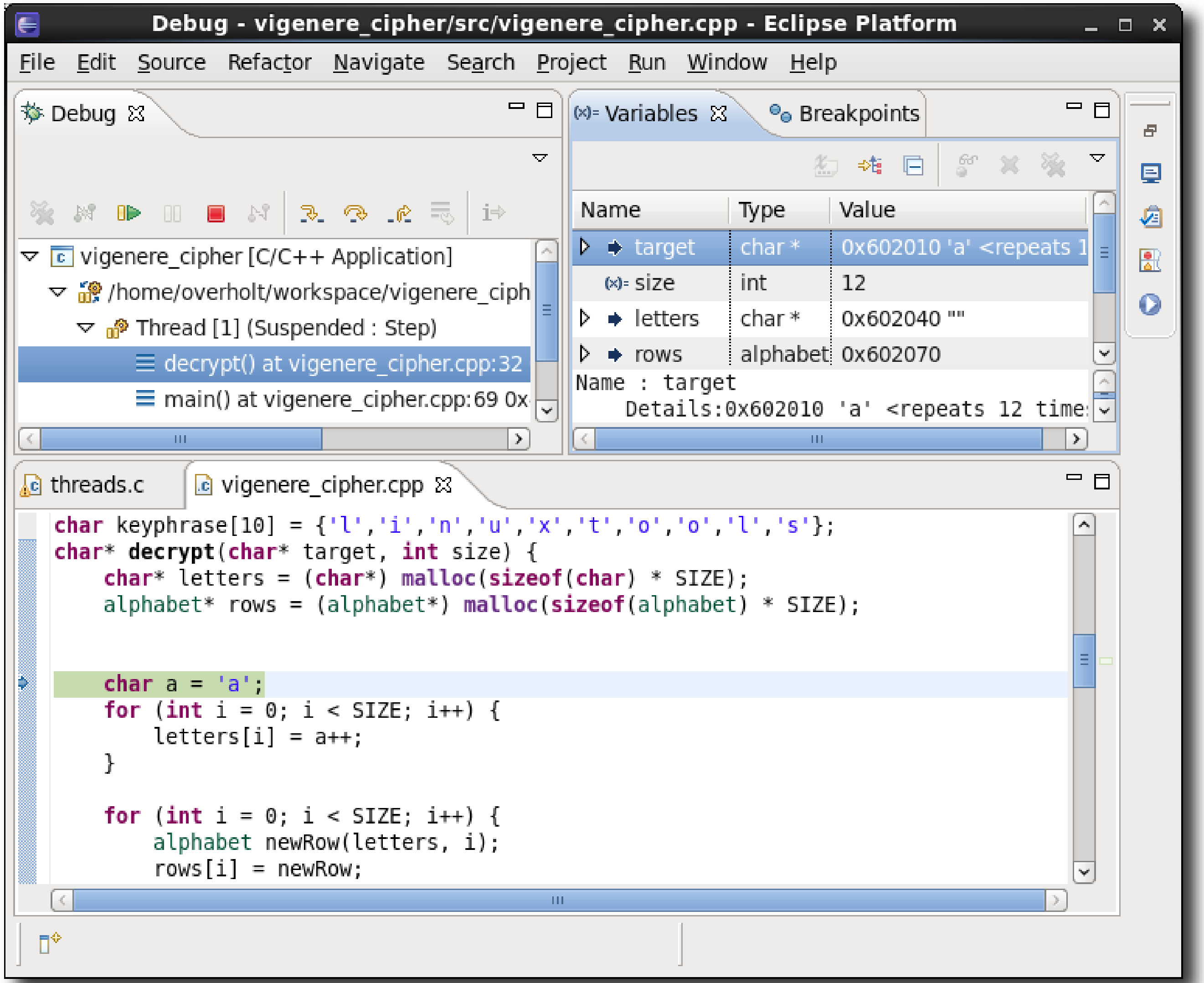
- AC_PI
- AC_IN
- AC_C
- AM_II
- PKG_
- AC_PI
- AC_C
- AC_O

Compile :: Build System :: Future

- Potential future features:
  - install dependencies listed in pkg-config information (configure.ac) and build logs
  - management of changes required in multiple files (ex. configure.ac and Makefile.am)

redhat

Debug :: C/C++


Debug - vigenere_cipher/src/vigenere_cipher.cpp - Eclipse Platform
File Edit Source Refactor Navigate Search Project Run Window Help
Debug
Variables
Breakpoints
threads.c
vigenere_cipher.cpp

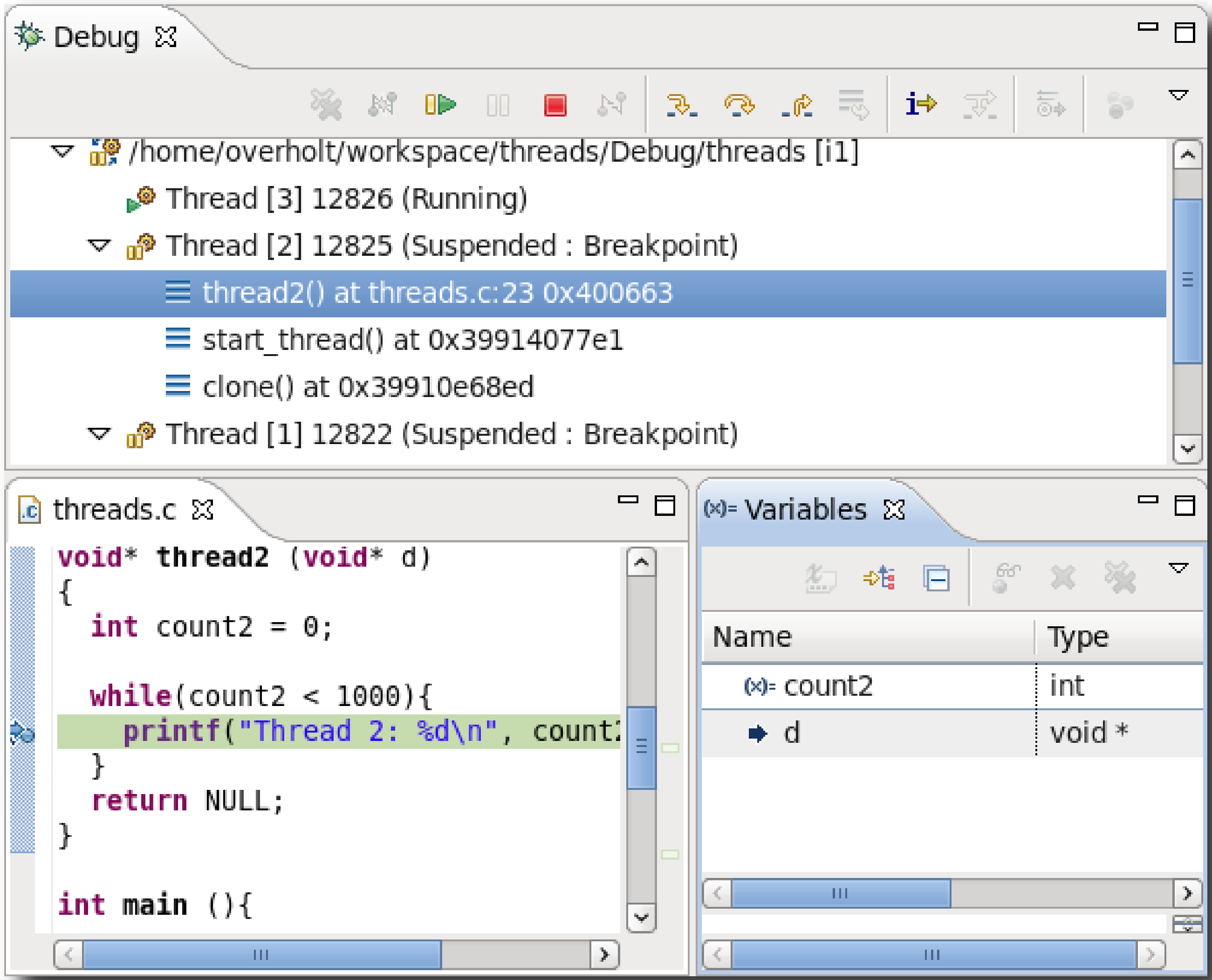
```
vigenere_cipher [C/C++ Application]
  /home/overholt/workspace/vigenere_ciph
    Thread [1] (Suspended : Step)
      decrypt() at vigenere_cipher.cpp:32
      main() at vigenere_cipher.cpp:69 0x
```

Name	Type	Value
target	char *	0x602010 'a' <repeats 1
size	int	12
letters	char *	0x602040 ""
rows	alphabet	0x602070

```
Name : target
    Details:0x602010 'a' <repeats 12 time
```

```
char keyphrase[10] = {'l','i','n','u','x','t','o','o','l','s'};
char* decrypt(char* target, int size) {
    char* letters = (char*) malloc(sizeof(char) * SIZE);
    alphabet* rows = (alphabet*) malloc(sizeof(alphabet) * SIZE);


    char a = 'a';
    for (int i = 0; i < SIZE; i++) {
        letters[i] = a++;
    }

    for (int i = 0; i < SIZE; i++) {
        alphabet newRow(letters, i);
        rows[i] = newRow;
```

Debug :: Multi-threaded C/C++ Debugging

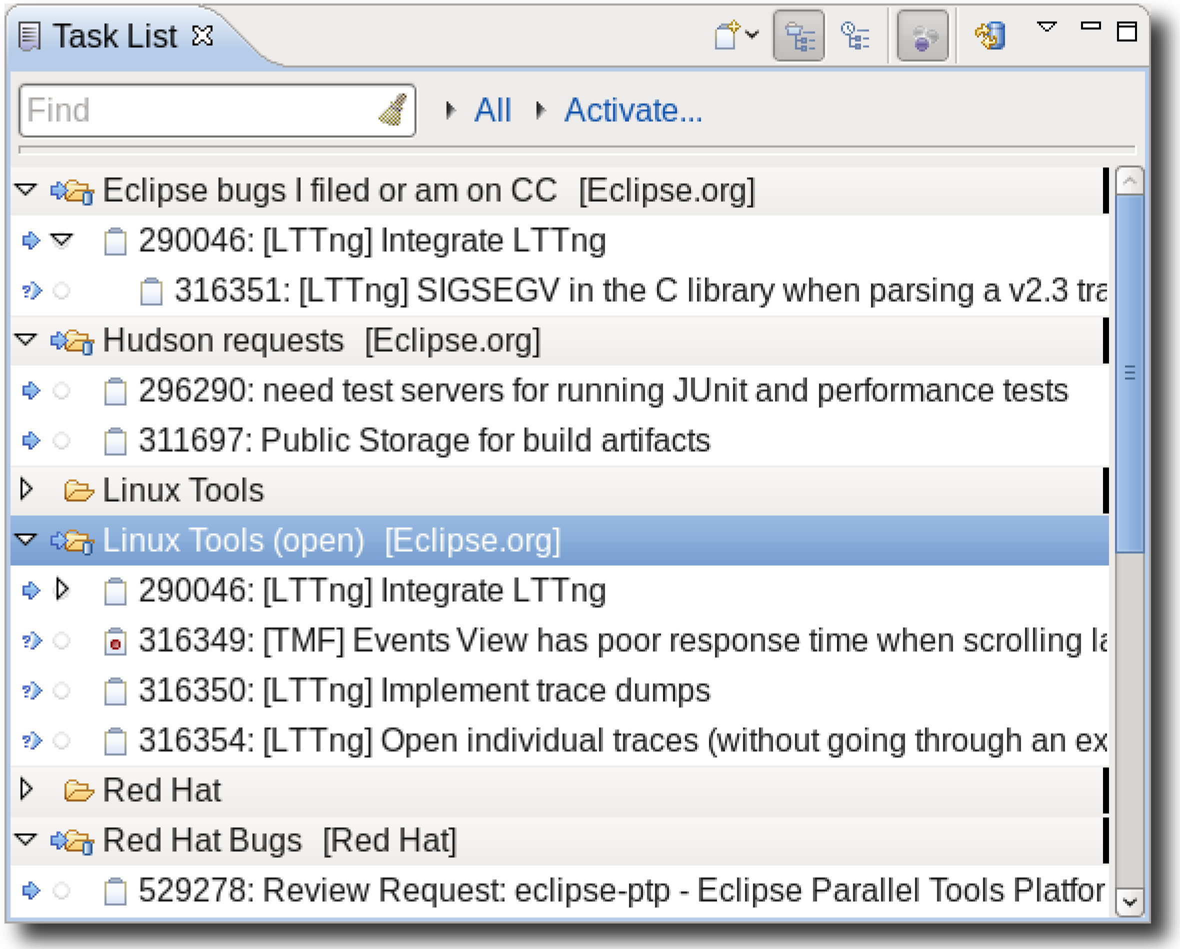


```
/home/overholt/workspace/threads/Debug/threads [i1]
    Thread [3] 12826 (Running)
    Thread [2] 12825 (Suspended : Breakpoint)
        thread2() at threads.c:23 0x400663
        start_thread() at 0x39914077e1
        clone() at 0x39910e68ed
    Thread [1] 12822 (Suspended : Breakpoint)
```

```
void* thread2 (void* d)
{
  int count2 = 0;

  while(count2 < 1000){
    printf("Thread 2: %d\n", count
  }
  return NULL;
}

int main (){
```

Name	Type
count2	int
d	void *

Issue Tracking :: Mylyn


Task List

Find

All

Activate...

Eclipse bugs I filed or am on CC [Eclipse.org]

290046: [LTTng] Integrate LTTng

316351: [LTTng] SIGSEGV in the C library when parsing a v2.3 tra

Hudson requests [Eclipse.org]

296290: need test servers for running JUnit and performance tests

311697: Public Storage for build artifacts

Linux Tools

Linux Tools (open) [Eclipse.org]

290046: [LTTng] Integrate LTTng

316349: [TMF] Events View has poor response time when scrolling la

316350: [LTTng] Implement trace dumps

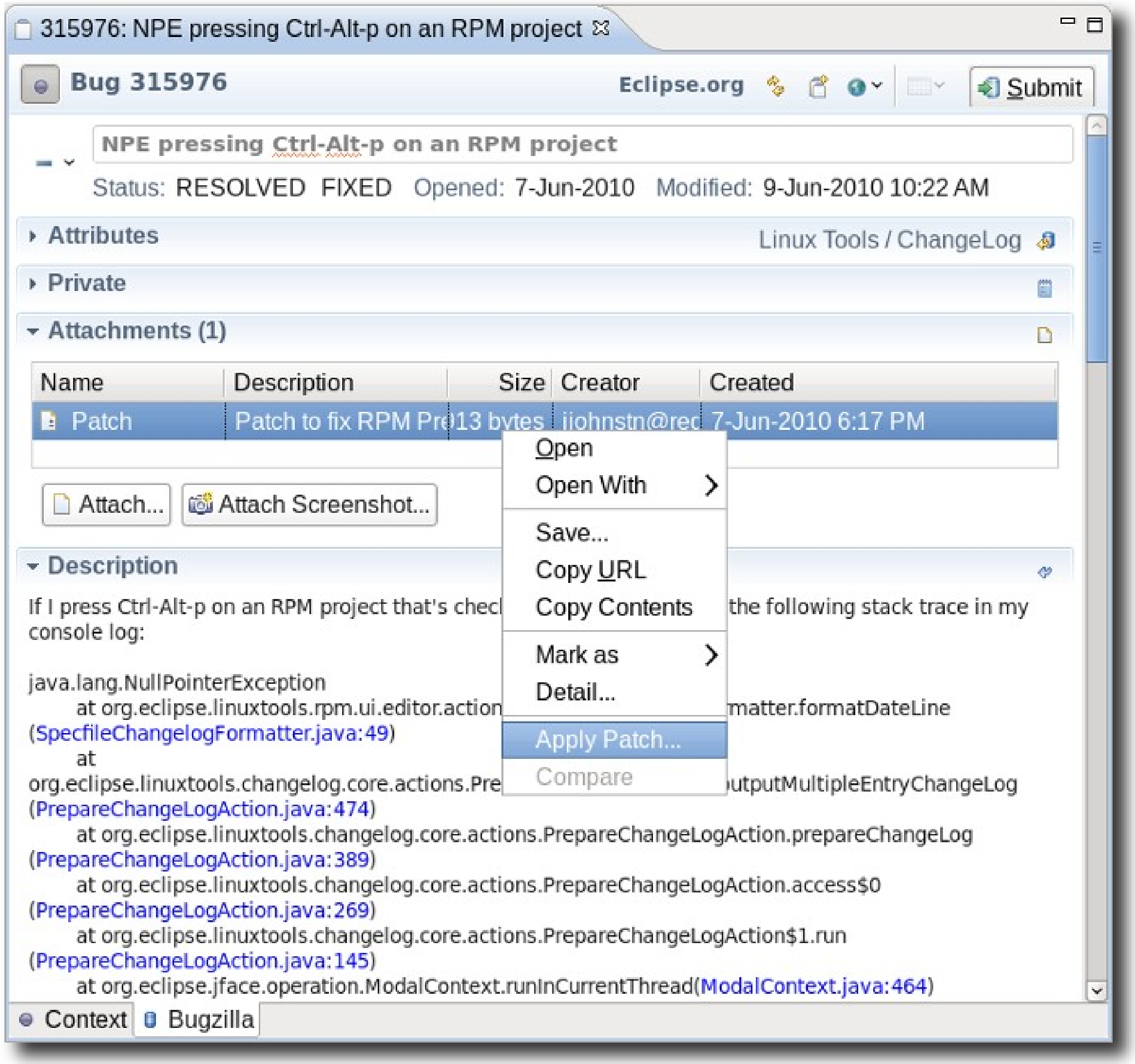
316354: [LTTng] Open individual traces (without going through an ex

Red Hat

Red Hat Bugs [Red Hat]

529278: Review Request: eclipse-ptp - Eclipse Parallel Tools Platfor

Issue Tracking :: Mylyn



NPE pressing Ctrl-Alt-p on an RPM project

Status: RESOLVED FIXED Opened: 7-Jun-2010 Modified: 9-Jun-2010 10:22 AM

Name	Description	Size	Creator	Created
Patch	Patch to fix RPM Pr	13 bytes	jjohnstn@red	7-Jun-2010 6:17 PM

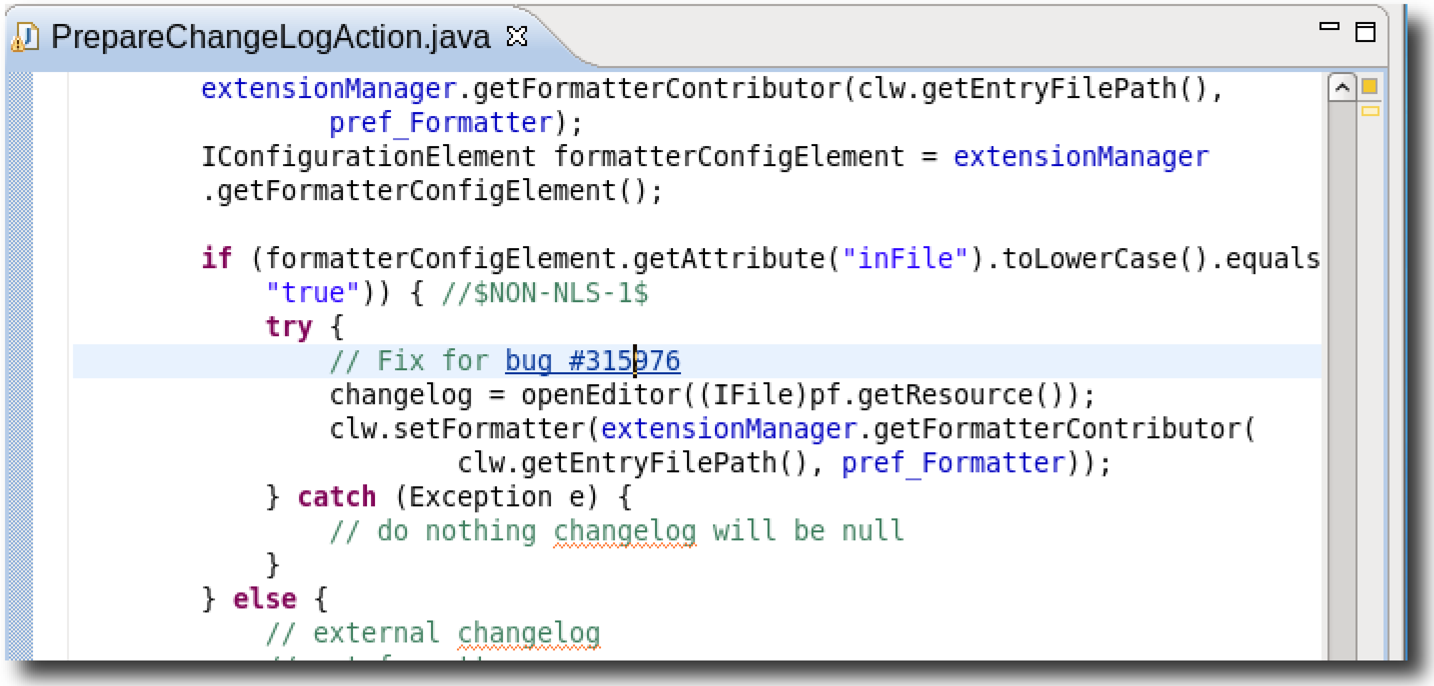
If I press Ctrl-Alt-p on an RPM project that's checl the following stack trace in my console log:

```
java.lang.NullPointerException
	at org.eclipse.linuxtools.rpm.ui.editor.action matter.formatDateLine
(SpecfileChangelogFormatter.java:49)
	at
org.eclipse.linuxtools.changelog.core.actions.Pre utputMultipleEntryChangeLog
(PrepareChangeLogAction.java:474)
	at org.eclipse.linuxtools.changelog.core.actions.PrepareChangeLogAction.prepareChangeLog
(PrepareChangeLogAction.java:389)
	at org.eclipse.linuxtools.changelog.core.actions.PrepareChangeLogAction.access$0
(PrepareChangeLogAction.java:269)
	at org.eclipse.linuxtools.changelog.core.actions.PrepareChangeLogAction$1.run
(PrepareChangeLogAction.java:145)
	at org.eclipse.jface.operation.ModalContext.runInCurrentThread(ModalContext.java:464)
```

Issue Tracking

- Rich editor in Eclipse
- Auto-synchronization and local caching
- Works with Bugzilla, Trac and other issue tracking systems

Issue Tracking :: Integration With Editors

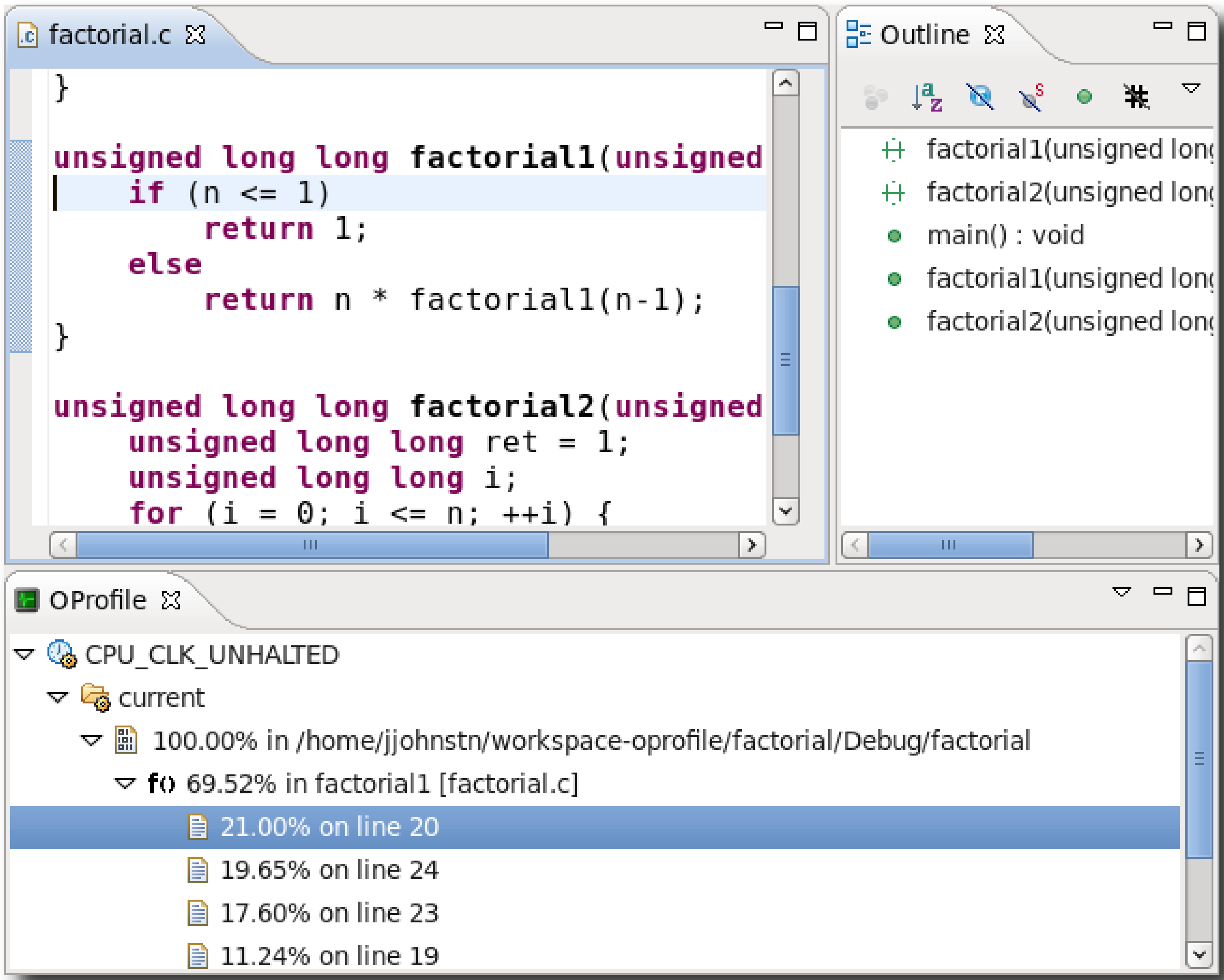


PrepareChangeLogAction.java

```
        extensionManager.getFormatterContributor(clw.getEntryFilePath(),
                pref_Formatter);
        IConfigurationElement formatterConfigElement = extensionManager
        .getFormatterConfigElement();

        if (formatterConfigElement.getAttribute("inFile").toLowerCase().equals
            "true")) { //$NON-NLS-1$
            try {
                // Fix for bug #315976
                changelog = openEditor((IFile)pf.getResource());
                clw.setFormatter(extensionManager.getFormatterContributor(
                        clw.getEntryFilePath(), pref_Formatter));
            } catch (Exception e) {
                // do nothing changelog will be null
            }
        } else {
            // external changelog
```

Ctrl-click on “bug #315976” opens that bug

Profile :: CPU Usage

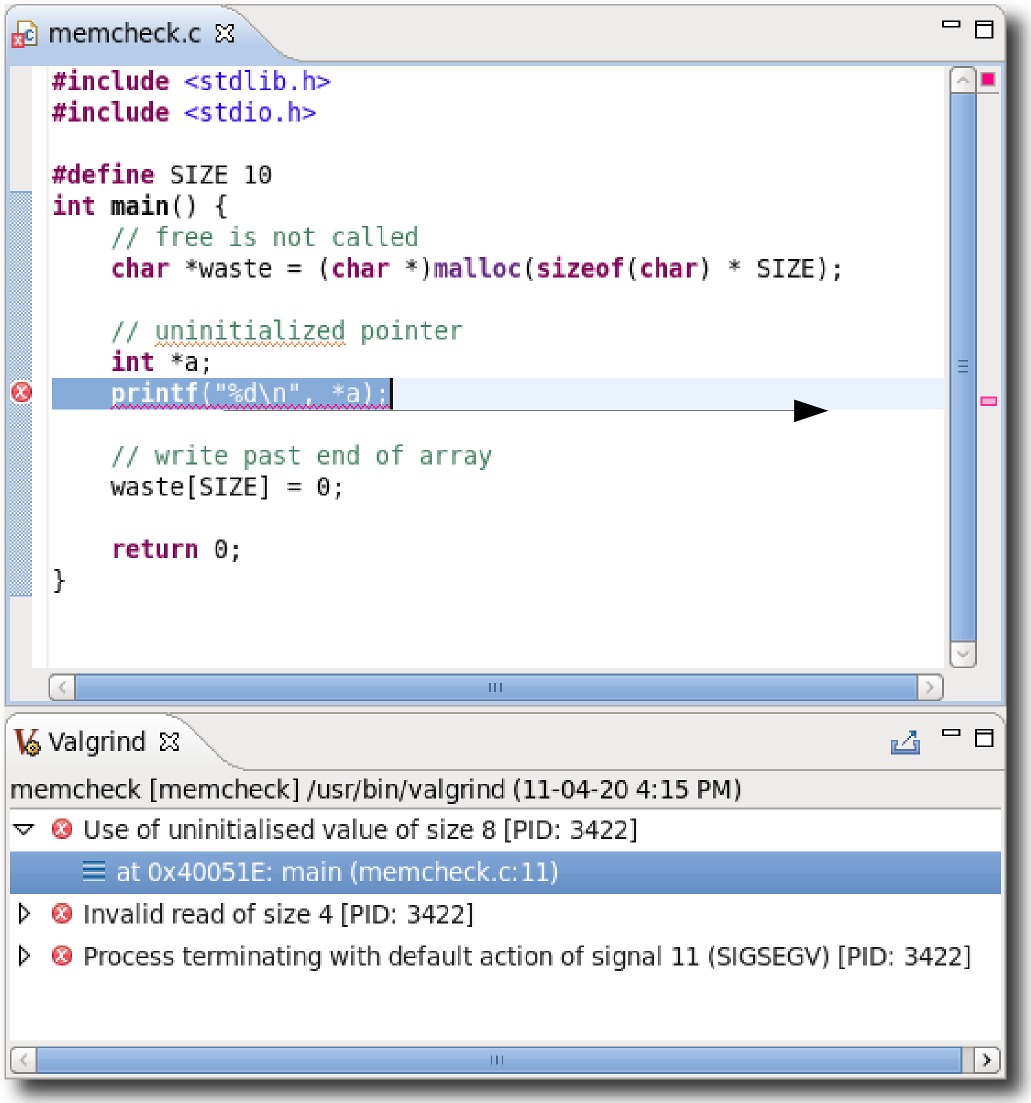


```
}

unsigned long long factorial1(unsigned
    if (n <= 1)
        return 1;
    else
        return n * factorial1(n-1);
}

unsigned long long factorial2(unsigned
    unsigned long long ret = 1;
    unsigned long long i;
    for (i = 0; i <= n; ++i) {
```

```
factorial1(unsigned long
factorial2(unsigned long
main() : void
factorial1(unsigned long
factorial2(unsigned long
```

```
CPU_CLK_UNHALTED
  current
    100.00% in /home/jjohnstn/workspace-oprofile/factorial/Debug/factorial
      f() 69.52% in factorial1 [factorial.c]
          21.00% on line 20
          19.65% on line 24
          17.60% on line 23
          11.24% on line 19
```

Profile :: Memory Errors :: Valgrind



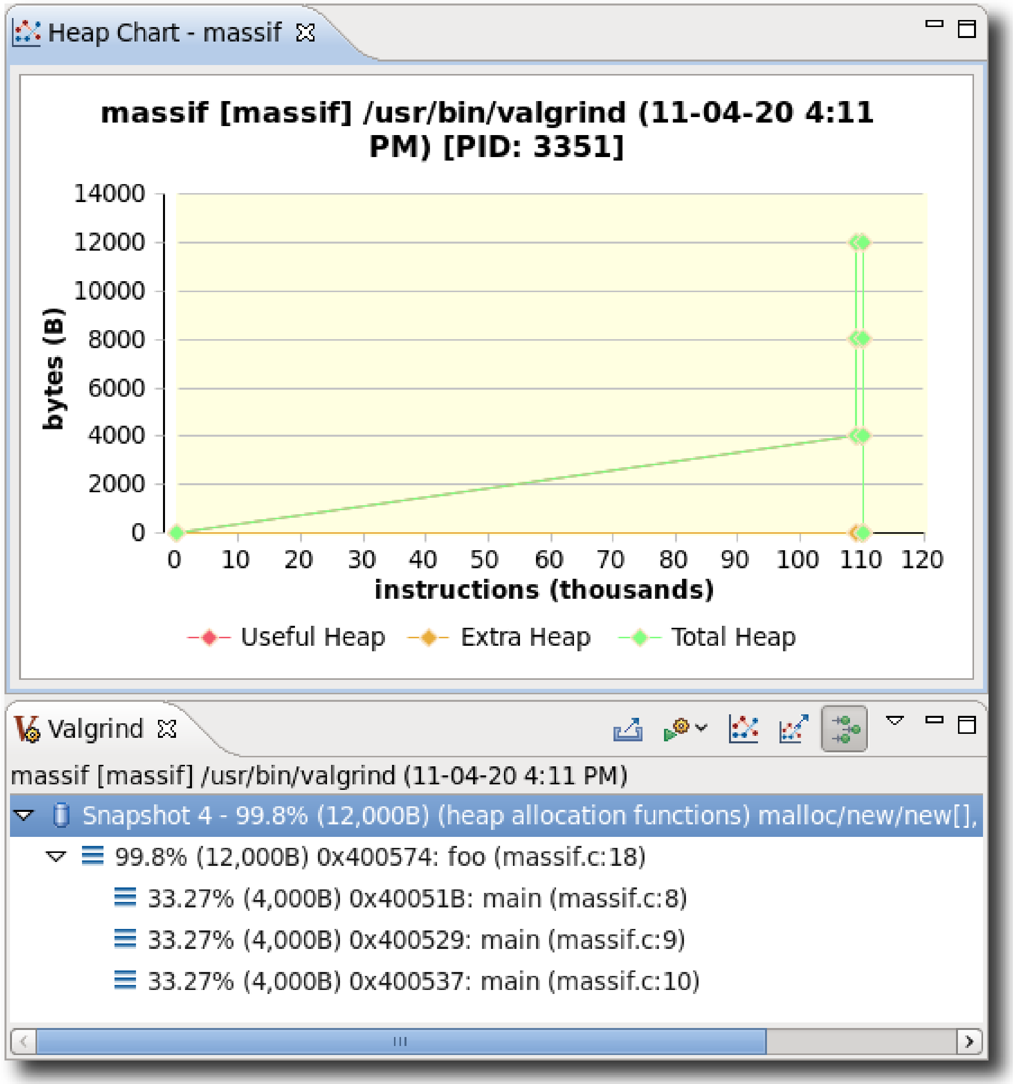
memcheck.c

```
#include <stdlib.h>
#include <stdio.h>

#define SIZE 10
int main() {
    // free is not called
    char *waste = (char *)malloc(sizeof(char) * SIZE);

    // uninitialized pointer
    int *a;
    printf("%d\n", *a);

    // write past end of array
    waste[SIZE] = 0;

    return 0;
}
```

Valgrind

```
memcheck [memcheck] /usr/bin/valgrind (11-04-20 4:15 PM)
  Use of uninitialised value of size 8 [PID: 3422]
      at 0x40051E: main (memcheck.c:11)
  Invalid read of size 4 [PID: 3422]
  Process terminating with default action of signal 11 (SIGSEGV) [PID: 3422]
```

Profile :: Heap Memory :: Valgrind



massif [massif] /usr/bin/valgrind (11-04-20 4:11 PM)

Snapshot 4 - 99.8% (12,000B) (heap allocation functions) malloc/new/new[],

99.8% (12,000B) 0x400574: foo (massif.c:18)

33.27% (4,000B) 0x40051B: main (massif.c:8)

33.27% (4,000B) 0x400529: main (massif.c:9)

33.27% (4,000B) 0x400537: main (massif.c:10)

Future

- perf contribution from IBM
- Plans: remote, VM integration somehow?, <your ideas here>

Join us

- We welcome contributors of all forms!
  - Plug-in testers
  - Plug-in developers
  - Web designers
  - Documentation authors
  - Graphic designers
  - Commercial adopters

Contact Information

- Eclipse
  - http://www.eclipse.org
- CDT
  - http://www.eclipse.org/cdt
- Mylyn
  - http://www.eclipse.org/mylyn
- Linux Tools Project
  - http://www.eclipse.org/linuxtools