Etnus TotalView on the Cray X1

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Presentation Overview

- Etnus TotalView Background
- Debugging issues unique to Cray X1
- Current capabilities
- Next release 4Q03
- Still to Come
- Slide show demonstration
- Summary

Etnus TotalView Background

- Common ancestor with Cray TotalView (CTV)
- Cray purchased software rights to Etnus TotalView (ETV) from Etnus LLC
- Periodic updates included
- Command Line Interface (CLI) version, **`totalviewcli`**, released December 2002
- Graphical User Interface (GUI) version, **`totalview`**, in final exposure
  - Based on ETV version 6.1

Debugging Issues Unique to Cray X1

- Vector registers
- Multi-stream processors (MSPs)
- Distributed Memory (DM) machine
- Remote Translation Table (RTT) shared memory core file sets
- **aprun** launcher

Current Capabilities

- Debugs command mode executables
- Debugs MSP mode, non-DM executables
- Performs **`-G0/-g`** live and core file debugging
- Supports C-Language, C++, Fortran, Assembly Language
- Supports X1 registers, NV1 instruction set, Unicos/mp
- Supports **`-Ostream0`** with streamed libraries

Next Release 4Q03

- Compensate for relocation of DM processes
- Support RTT shared memory core file debugging
- Support **aprun** launching of DM jobs in concert with the debugger
- Access to information from SSPs 1-3
- Upgrade to latest Etnus TotalView source
- Improve debugger group's regression test suite

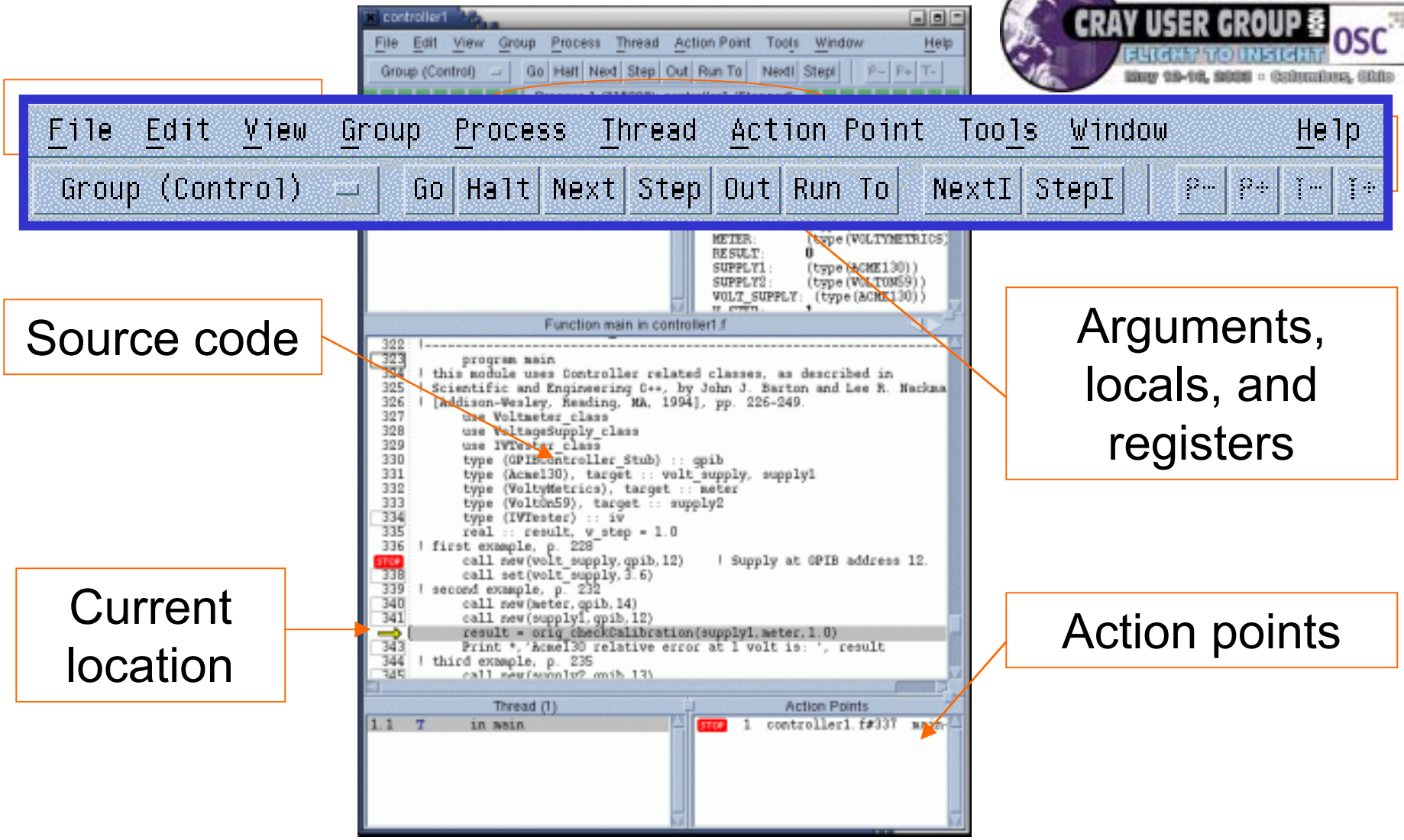
Still to Come

- Direct support for Distributed Memory models
  - MPI, CoArrays, UPC
- Direct support for Shared Memory models
  - PThreads, OpenMP
- Support **`-G1/-gp`**
- Support for Vector registers
- Support for Watchpoints
- Provide DebugView like capability

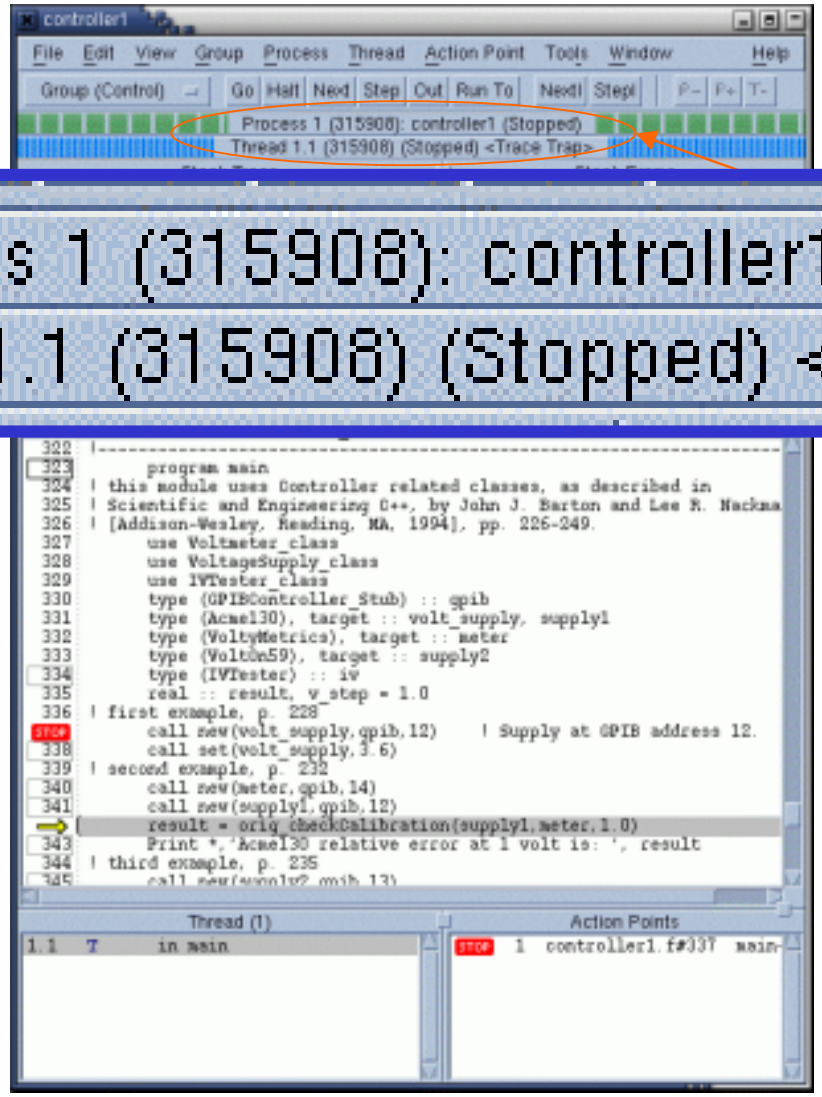
Demo Overview

– A “live” demonstration via slides
  - GUI demo
  - CLI demo

Process/Thread Window

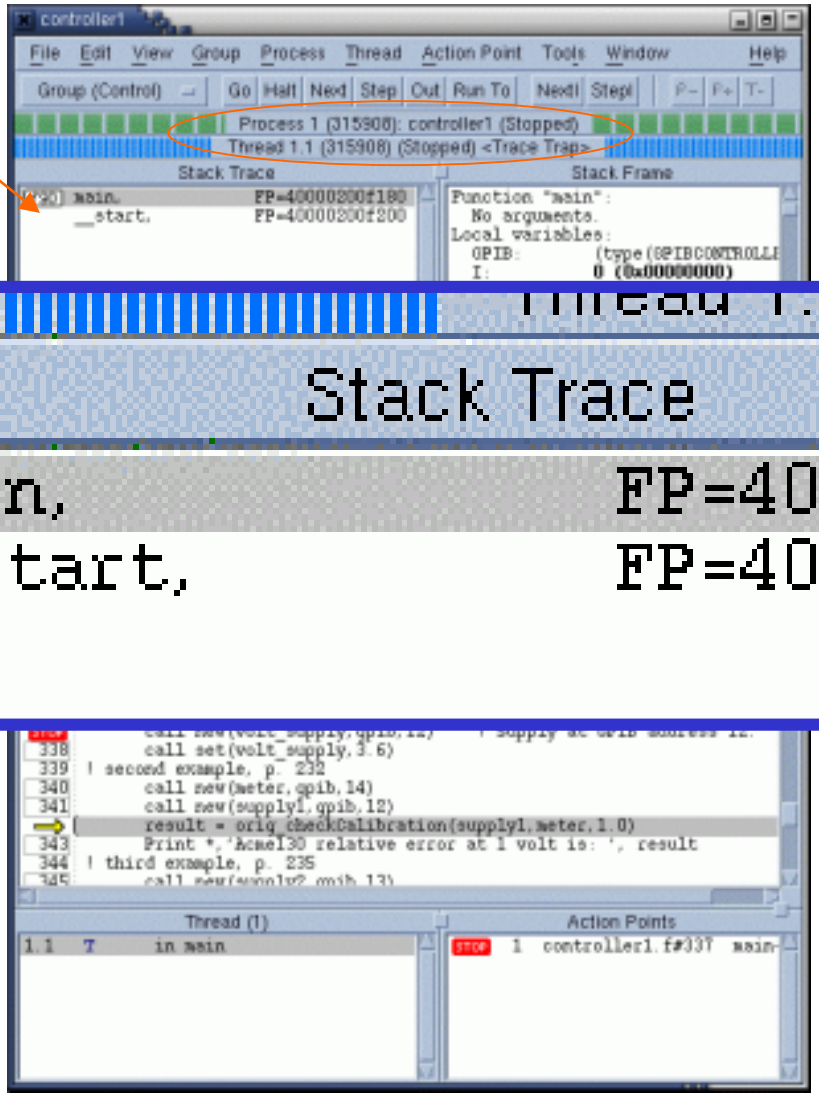


Process Status



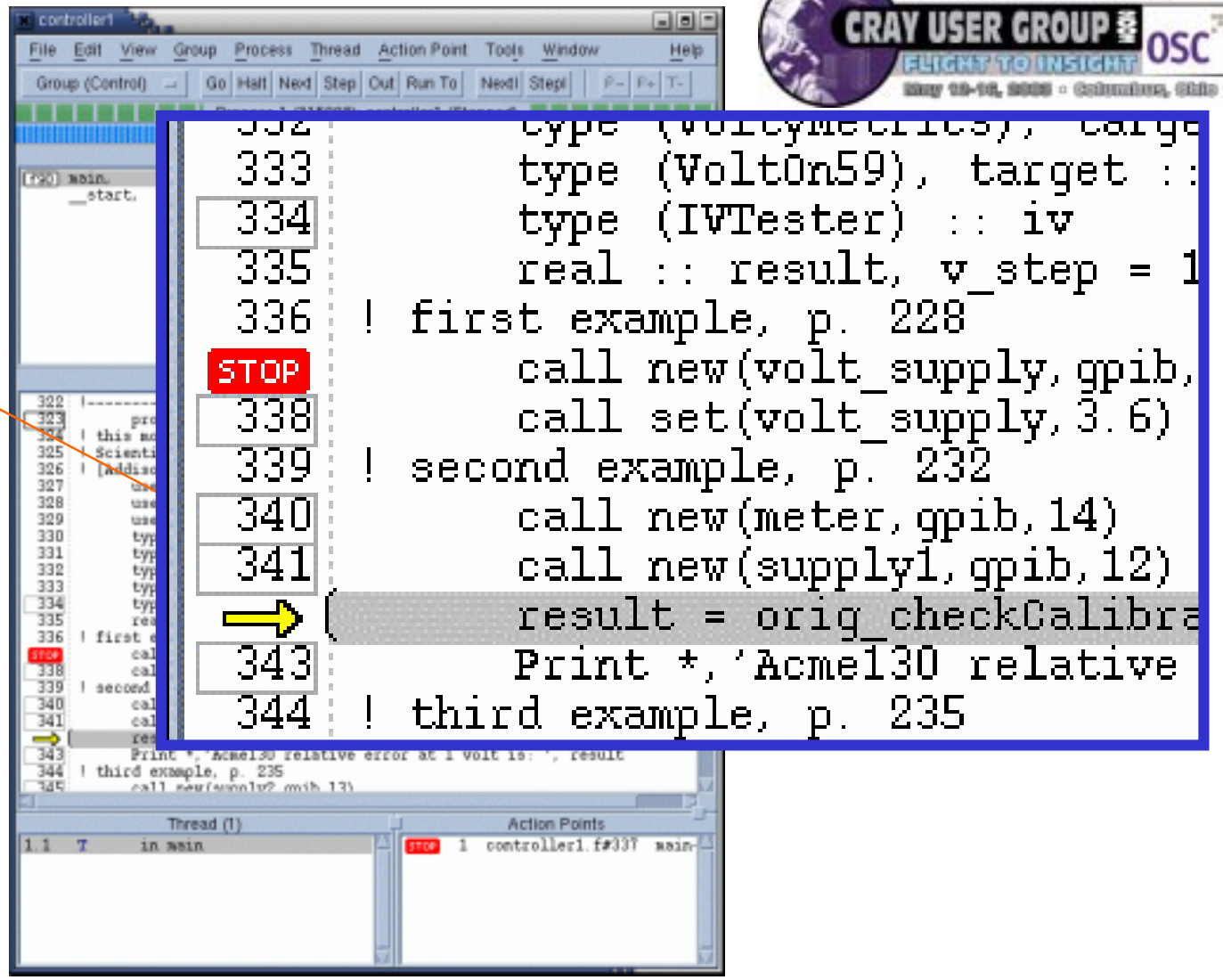
Stack Trace Pane

Stack trace

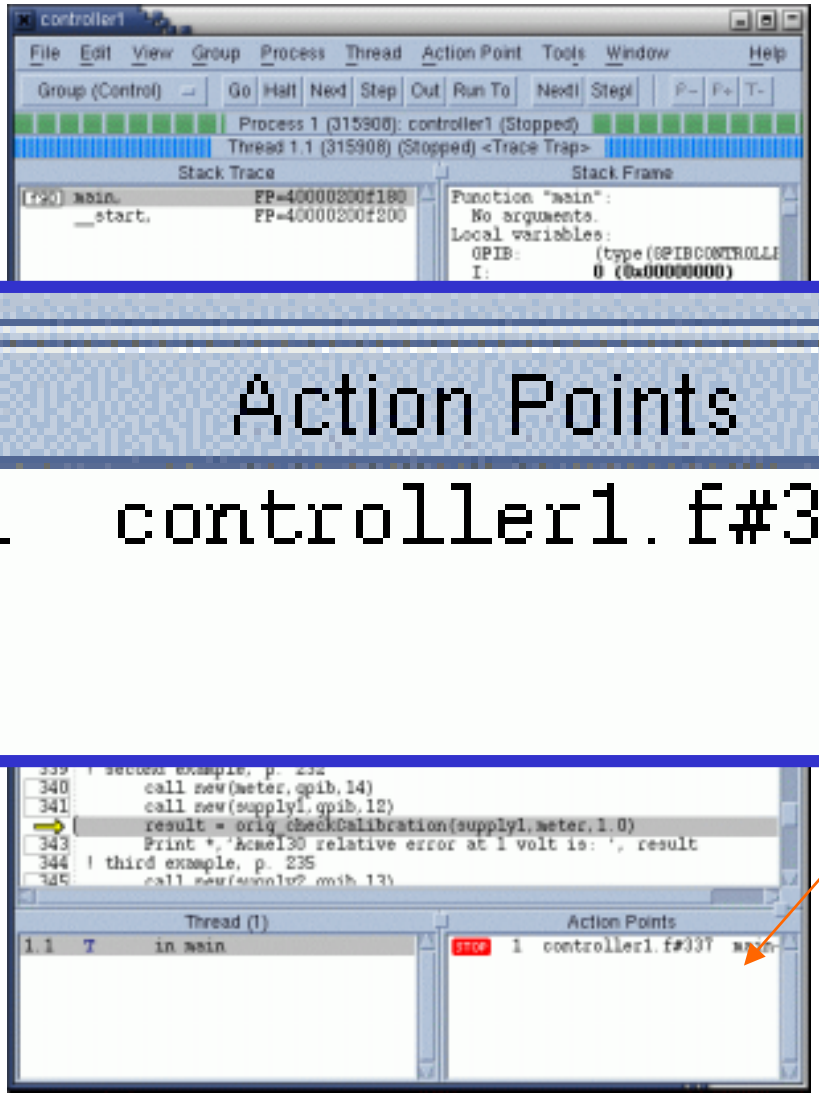


Source Pane

Source code

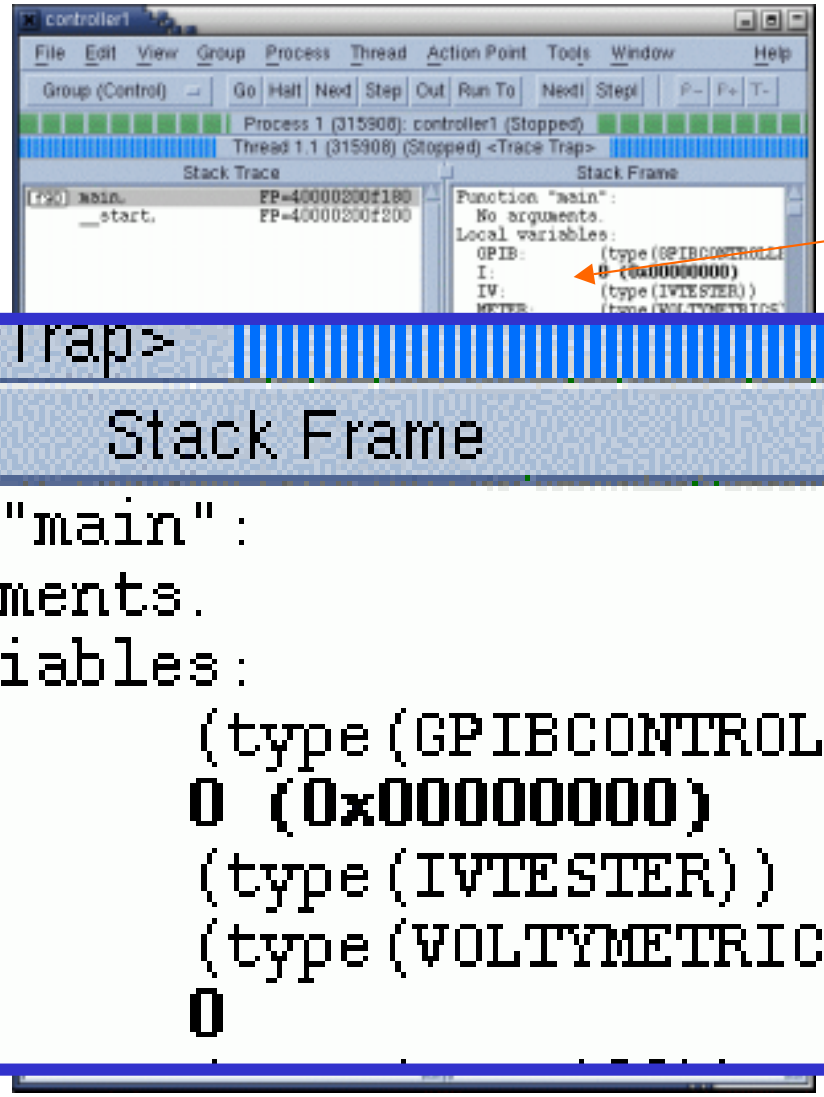


Action Points Pane



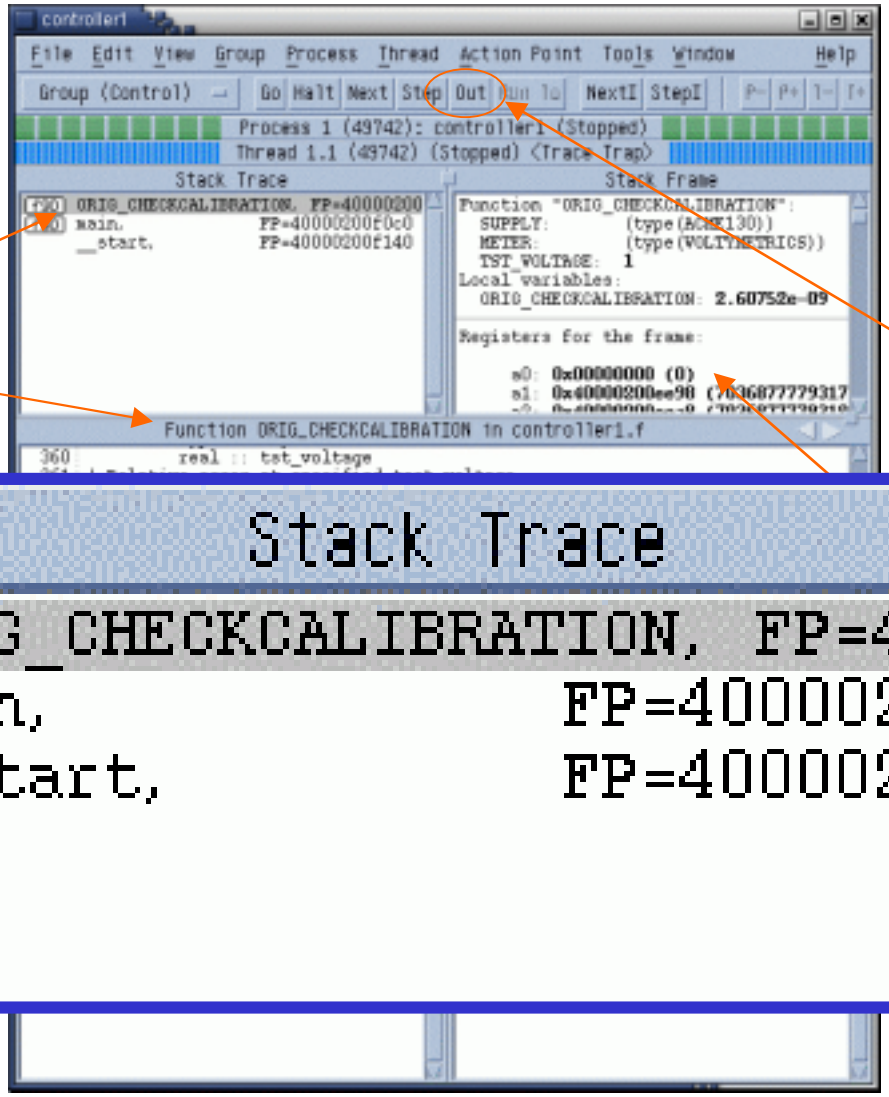
Action points

Stack Frame Pane



Arguments, locals, and registers

Stepped into New Function



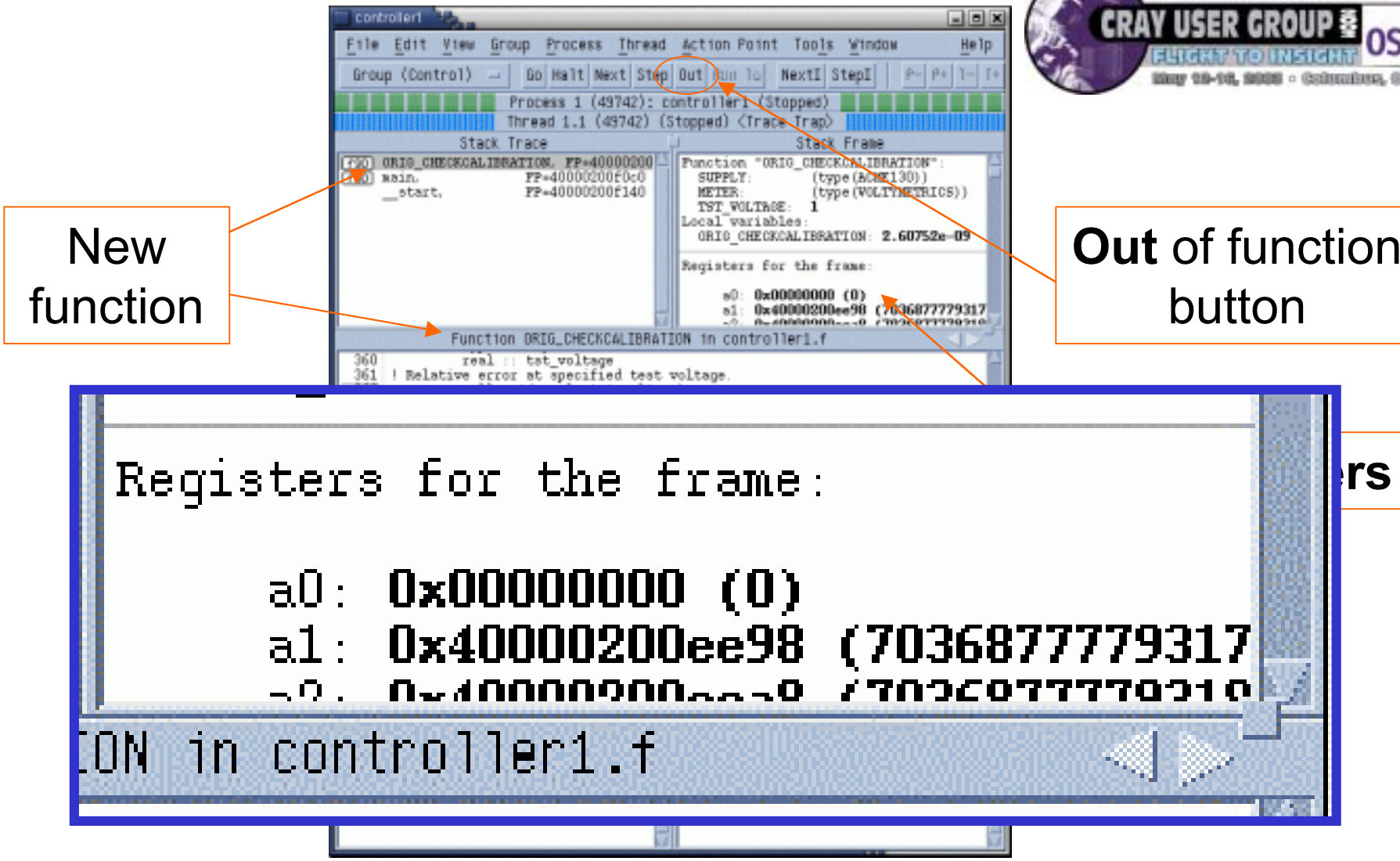
New function

Out of function button

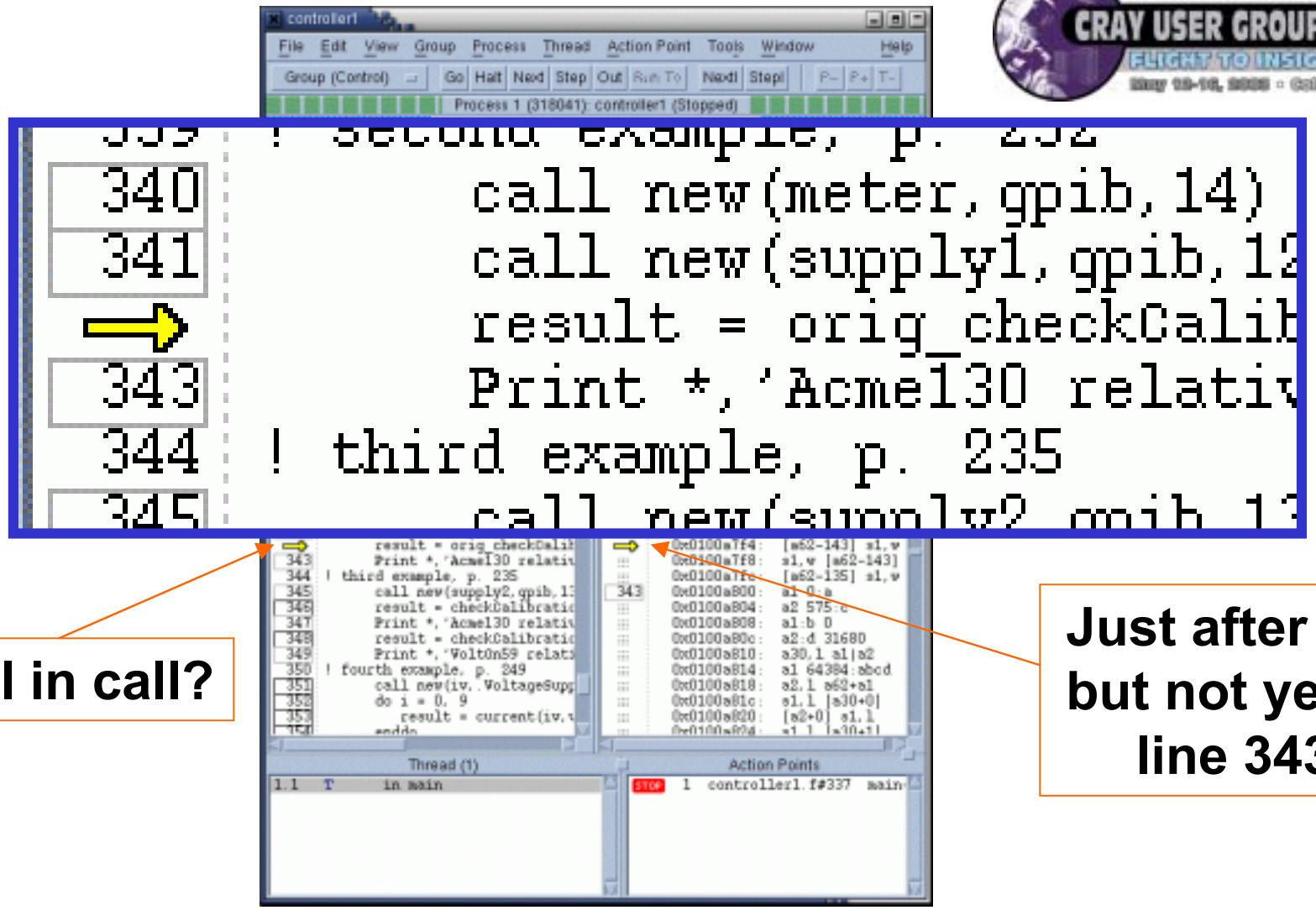
Stack Trace

f90 ORIG_CHECKCALIBRATION, FP=40000200
f90 main, FP=4000200f0c0
__start, FP=4000200f140

X1 Registers



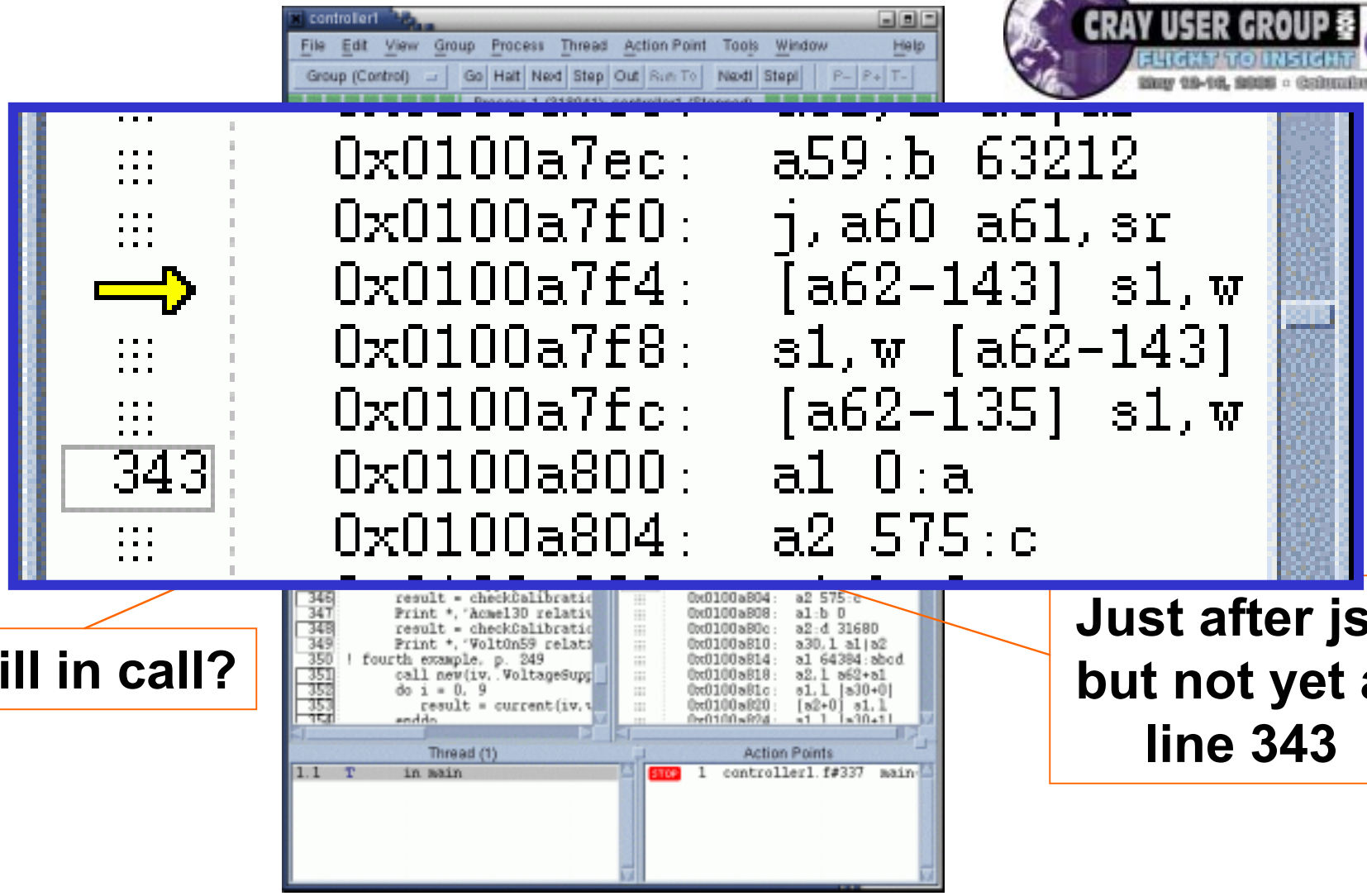
Stepping out to Assembly View



Still in call?

Just after jsr, but not yet at line 343

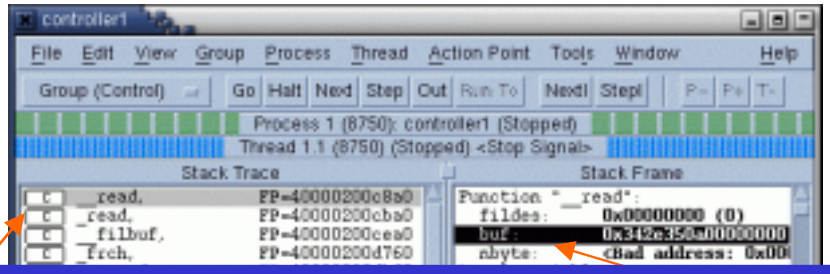
Assembly



Still in call?

Just after jsr, but not yet at line 343

Halting the Run



Mixed lan

Div

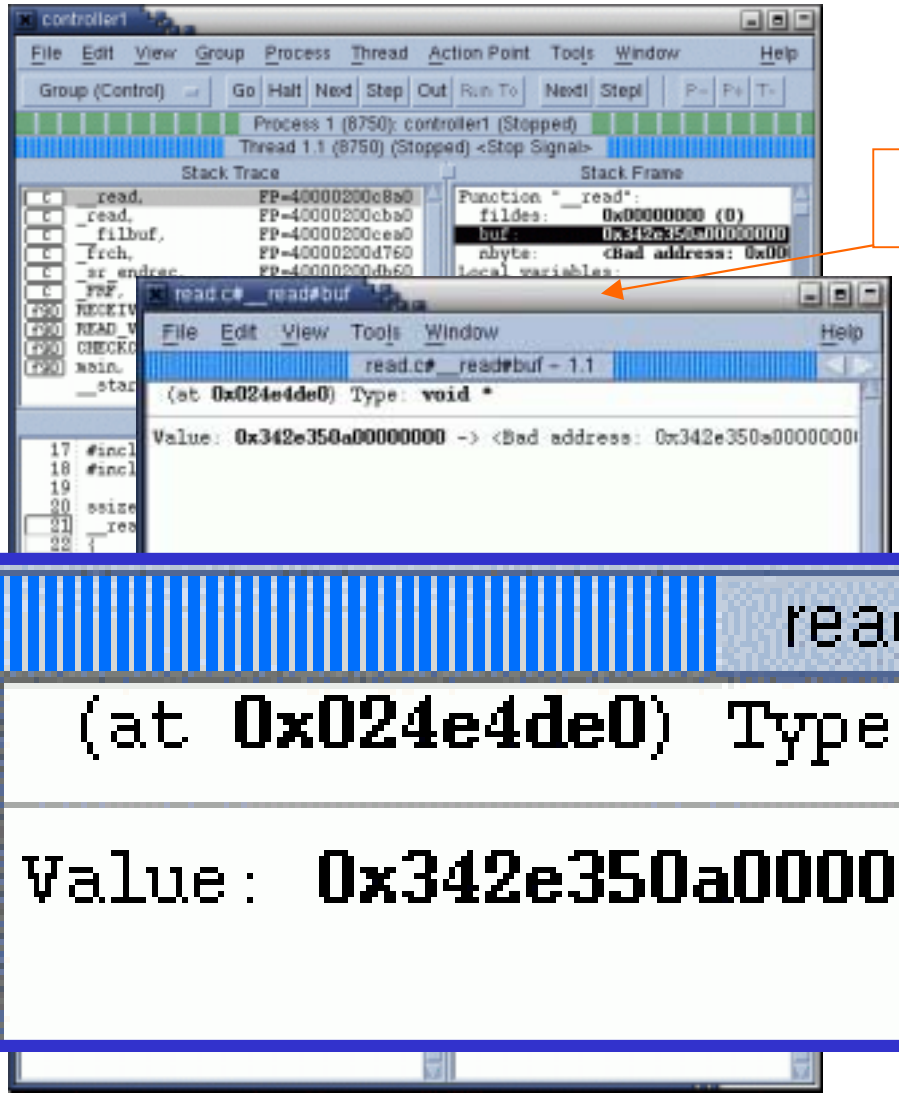
Diving on data

Diving on tion points

Stack Trace

C	__read,	FP=40000200c8a0
C	_read,	FP=40000200cba0
C	__filbuf,	FP=40000200cea0
C	_frch,	FP=40000200d760
C	_sr_endrec,	FP=40000200db60
C	_FRF,	FP=40000200e100
f90	RECEIVE,	FP=40000200e520
f90	READ_VM,	FP=40000200e7e0
f90	CHECKCALIBRATION,	FP=40000200eaa0
f90	main,	FP=40000200f180
	__start,	FP=40000200f200

Diving on Data



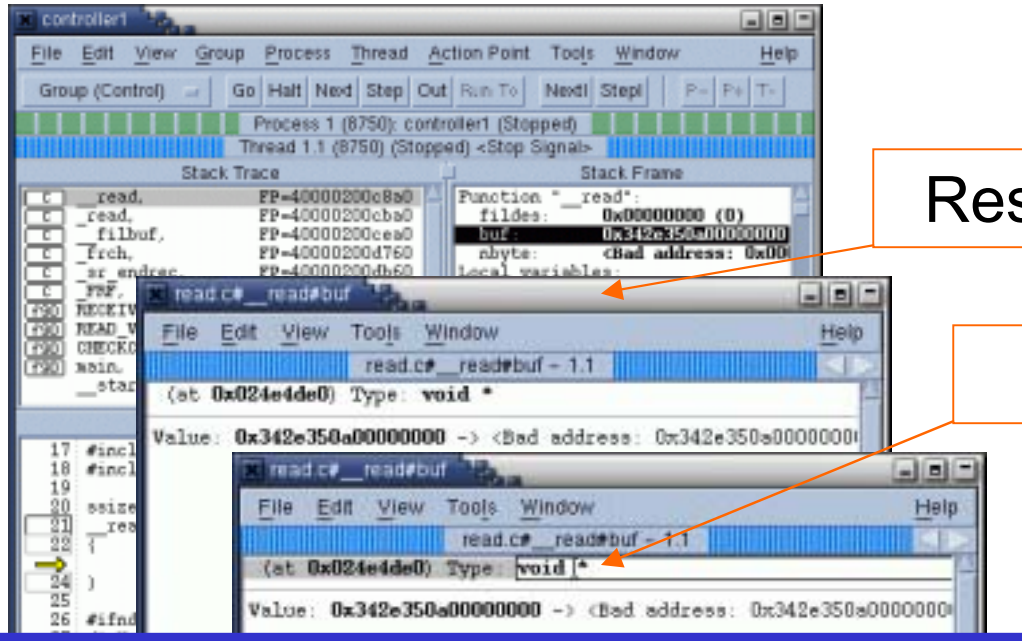
Result of diving on *buf*

read.c#__read#buf - 1.1

(at **0x024e4de0**) Type: **void ***

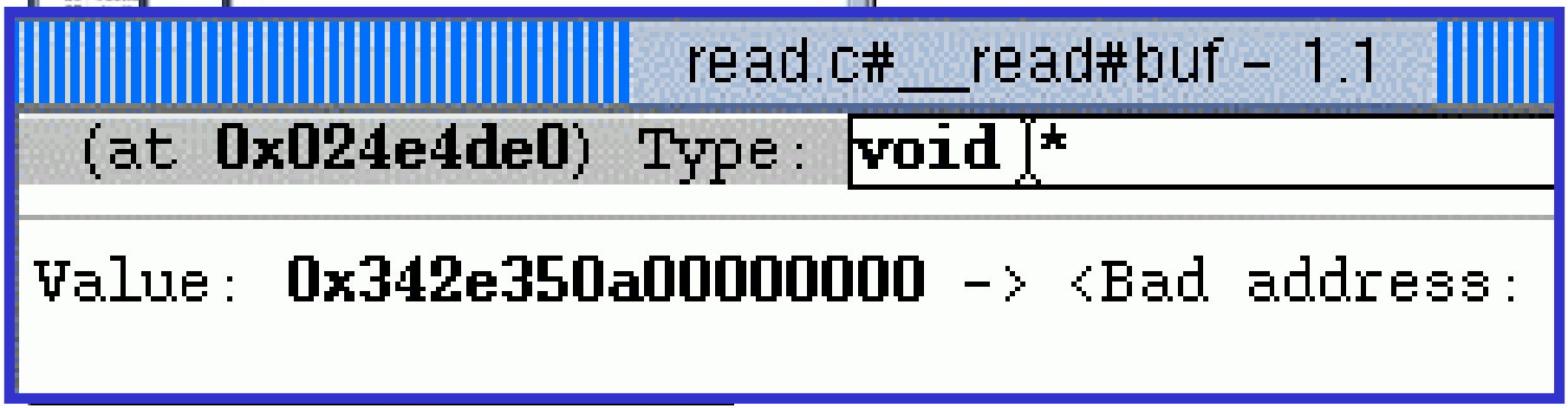
Value: **0x342e350a00000000** -> <Bad address:

Diving on Data

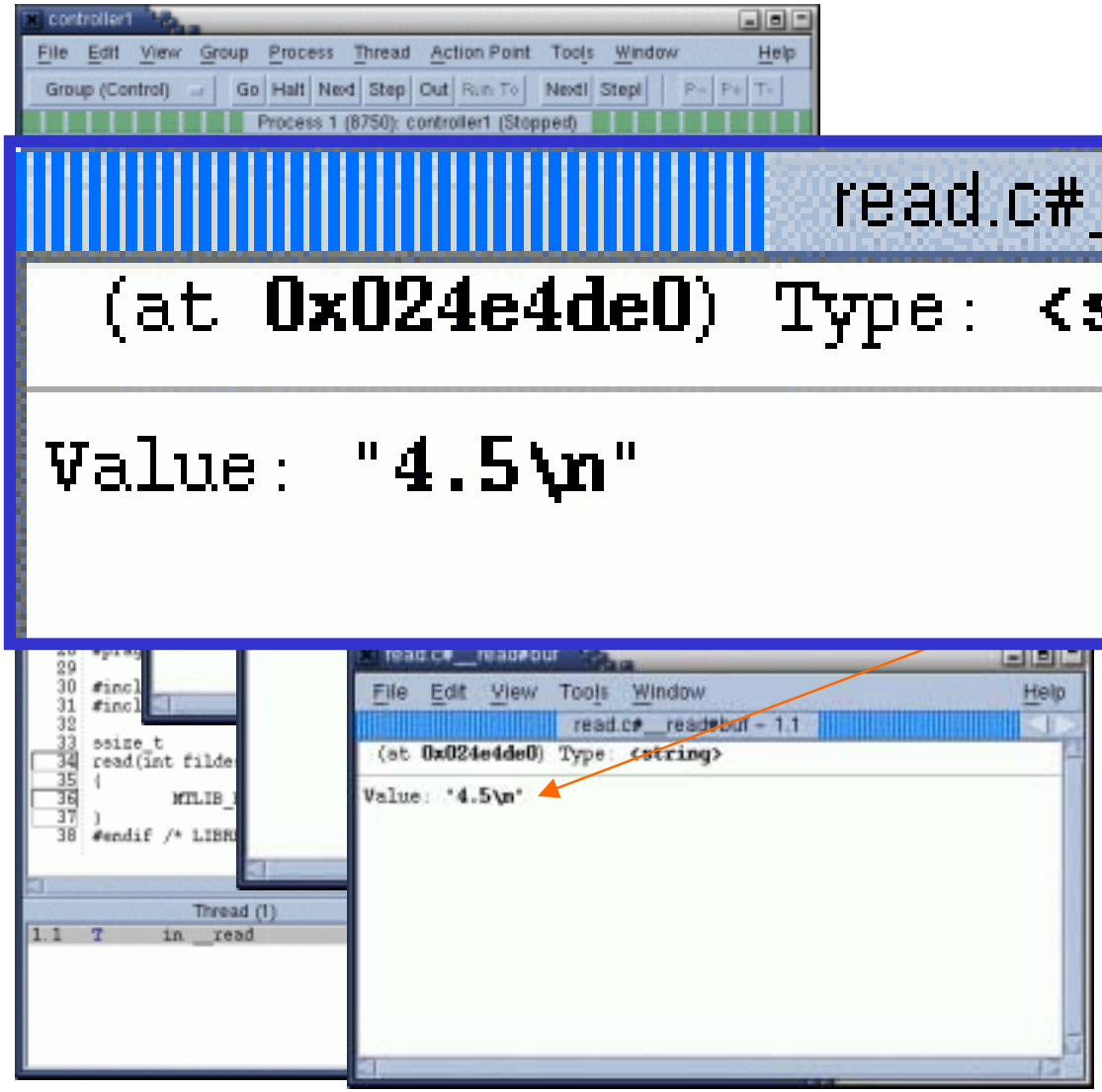


Result of diving on *buf*

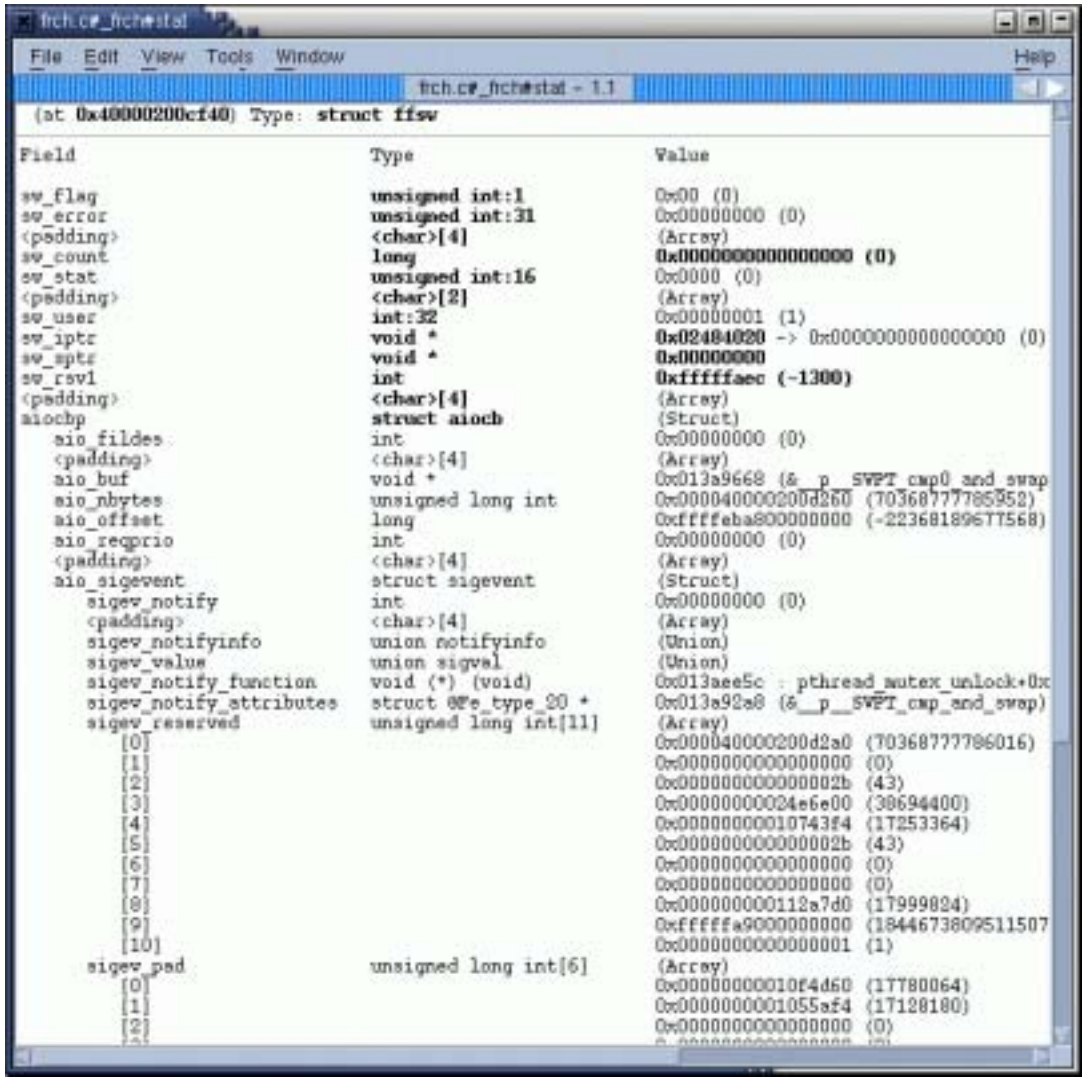
Editing type of *buf*



Diving on Data



More Data


frch.c#_frch#stat
File Edit View Tools Window Help
frch.c#_frch#stat - 1.1
(at 0x40000200cf40) Type: struct ffsw
Field Type Value
sw_flag unsigned int:1 0x00 (0)
sw_error unsigned int:31 0x00000000 (0)
<padding> <char>[4] (Array)
sw_count long 0x0000000000000000 (0)
sw_stat unsigned int:16 0x0000 (0)
<padding> <char>[2] (Array)
sw_user int:32 0x00000001 (1)
sw_iptr void * 0x02484020 -> 0x0000000000000000 (0)
sw_sptr void * 0x00000000
sw_rsv1 int 0xfffffaec (-1300)
<padding> <char>[4] (Array)
aiocbp struct aiocb (Struct)
aio_fildes int 0x00000000 (0)
<padding> <char>[4] (Array)
aio_buf void * 0x013a9668 (&__p__SVPT_cmp0_and_swap
aio_nbytes unsigned long int 0x000040000200d260 (70368777785952)
aio_offset long 0xffffeba800000000 (-2236818967T568)
aio_reqprio int 0x00000000 (0)
<padding> <char>[4] (Array)
aio_sigevent struct sigevent (Struct)
sigev_notify int 0x00000000 (0)
<padding> <char>[4] (Array)
sigev_notifyinfo union notifyinfo (Union)
sigev_value union sigval (Union)
sigev_notify_function void (*) (void) 0x013aee5c : pthread_mutex_unlock+0x
sigev_notify_attributes struct 0fe_type_20 * 0x013a92a8 (&__p__SVPT_cmp_and_swap)
sigev_reserved unsigned long int[11] (Array)
[0] 0x000040000200d2a0 (70368777786016)
[1] 0x0000000000000000 (0)
[2] 0x000000000000002b (43)
[3] 0x00000000024e6e00 (38694400)
[4] 0x0000000010743f4 (17253364)
[5] 0x000000000000002b (43)
[6] 0x0000000000000000 (0)
[7] 0x0000000000000000 (0)
[8] 0x0000000000112a7d0 (17999824)
[9] 0xfffffa9000000000 (18446738095115O7
[10] 0x0000000000000001 (1)
sigev_pad unsigned long int[6] (Array)
[0] 0x000000000010f4d60 (17780064)
[1] 0x0000000001055af4 (17128180)
[2] 0x0000000000000000 (0)

CLI

- Stand-alone or with GUI
- Command line ASCII input
- Tcl based interface
  - ‘d’ prefix on TotalView commands
  - Watch out for special characters!!
    - **$, [,], {, }, #, ;, “, space**
- Programmable

CLI Startup


```
sn702> totalviewcli controller1
d1.<> dbreak 337
1
d1.<> dgo
Created process 1 (71894), named "controller1"
Thread 1.1 has appeared
Thread 1.1 hit breakpoint 1 at line 337 in
  "main"
d1.<> dcont
```

Application Input


```
(Acme130 now at address 12 )
 (GPIB instrument #  12  sends value  3.5999999 )
 (VoltyMetrics now at address 14 )
 (Acme130 now at address 12 )
 (GPIB instrument #  12  sends value  1. )
 (Please enter number for GPIB instrument # 14 )
4.5
 Acme130 relative error at 1 volt is:  3.5999999
 (GPIB instrument #  13  sends value  1. )
 (Please enter number for GPIB instrument # 14 )
Thread 1.1 received a signal (Interrupt)
```

dwhere


```
d1.<> dwhere
>0 __read     PC=0x0110e810, FP=0x40000200c7e0 [read.c#23]
 1 _read      PC=0x0110ee0c, FP=0x40000200cae0 [read.c#36]
 2 __filbuf   PC=0x0110c614, FP=0x40000200cde0 [_filbuf.c#65]
 3 _frch      PC=0x010e51b4, FP=0x40000200d6a0 [frch.c#224]
 4 _sr_endrec PC=0x0108ece8, FP=0x40000200daa0 [rf.c#876]
 5 _FRF       PC=0x01041d00, FP=0x40000200e040 [rf90.c#333]
 6 RECEIVE    PC=0x01003c3c, FP=0x40000200e460 [cont.f#50]
 7 READ_VM    PC=0x01005af0, FP=0x40000200e720 [cont.f#142]
 8 CHECKCAL   PC=0x01009928, FP=0x40000200e9e0 [cont.f#363]
 9 main       PC=0x0100abac, FP=0x40000200f0c0 [cont.f#348]
 10 __start   PC=0x010019d4, FP=0x40000200f140 [cont]
```

dlist


```
d1.<> dlist
  16   #include <sys.s>
  17   #include "sys/sv2/syscall.h"
  18   #include <unistd.h>
  19
  20   ssize_t
  21   __read(int fildes, void *buf, size_t nbyte)
  22   {
  23 >   USUAL_SYSCALL(ssize_t, SYS_read, ARG_LIST3(fildes,
  24                                                buf, nbyte));
  25   }
  26
  27   #ifndef LIBRESTART_LIBC
  28   /* Wrapper for pthread callback */
  29   #pragma weak read = _read
```

dprint


```
d1.<> dprint *buf
 *buf = <Bad address: 0x342e350a00000000>
d1.<> dwhat buf
In thread 1.1:
Name: buf; Type: void *; Size: 8 bytes;Addr: 0x024e4de0
   Scope: ##controller1#read.c#__read(Scope class: Any)
   Address class: reference_param(Reference parameter)
d1.<>  dprint *(<string>*)&buf
 *(<string>*)&buf = "4.5\n"
```

TCL “for”


```
d1.<> for {set i 57} {$i < 64} {incr i} {dprint \$a$i}
 $a57 = 0x00002fffffffffe0 (52776558133216)
 $a58 = 0x0003000000000000 (52776558133248)
 $a59 = 0xfffffb8c00000000 (-4896262717440)
 $a60 = 0x000000000110ee0c (17886732)
 $a61 = 0x000000000110e7c8 (17885128)
 $a62 = 0x0004000200c7e0 (70368777783264)
 $a63 = 0x0004000200c500 (70368777782528)
```

Summary

- Etnus TotalView is a strong base for our debugging platform.
- There is more to be done.
- Management has increased our resources.