gem5

HORRORS

Jason Power
UW-Madison

I ♥ gem5


Deadline
Mortgage
Poor Leadership
E=MC²
learning objective
Business Crisis
BILLS
Wrong Fields
Bullying
Debt
TAX
Conflict

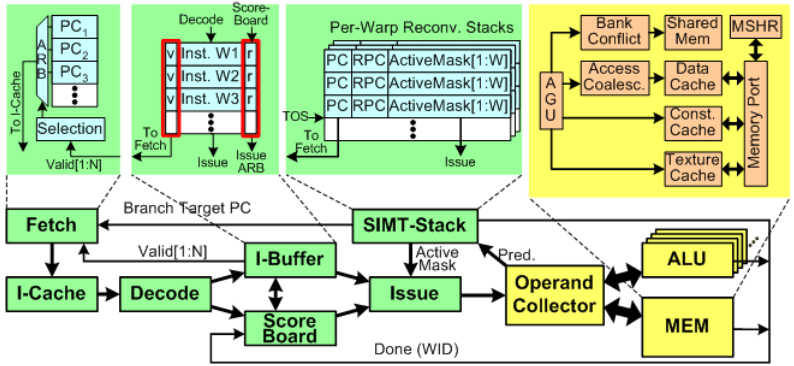

Growing Pains

Outline

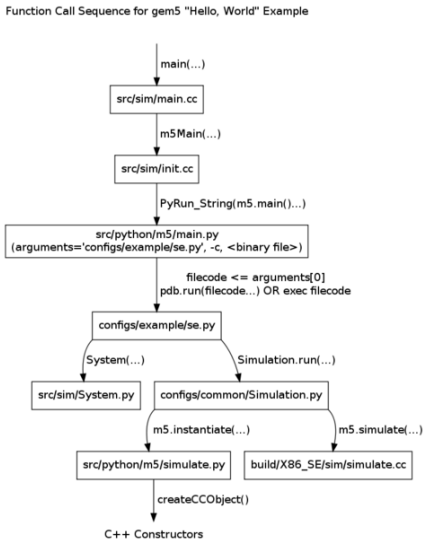
My story

gem5GPU

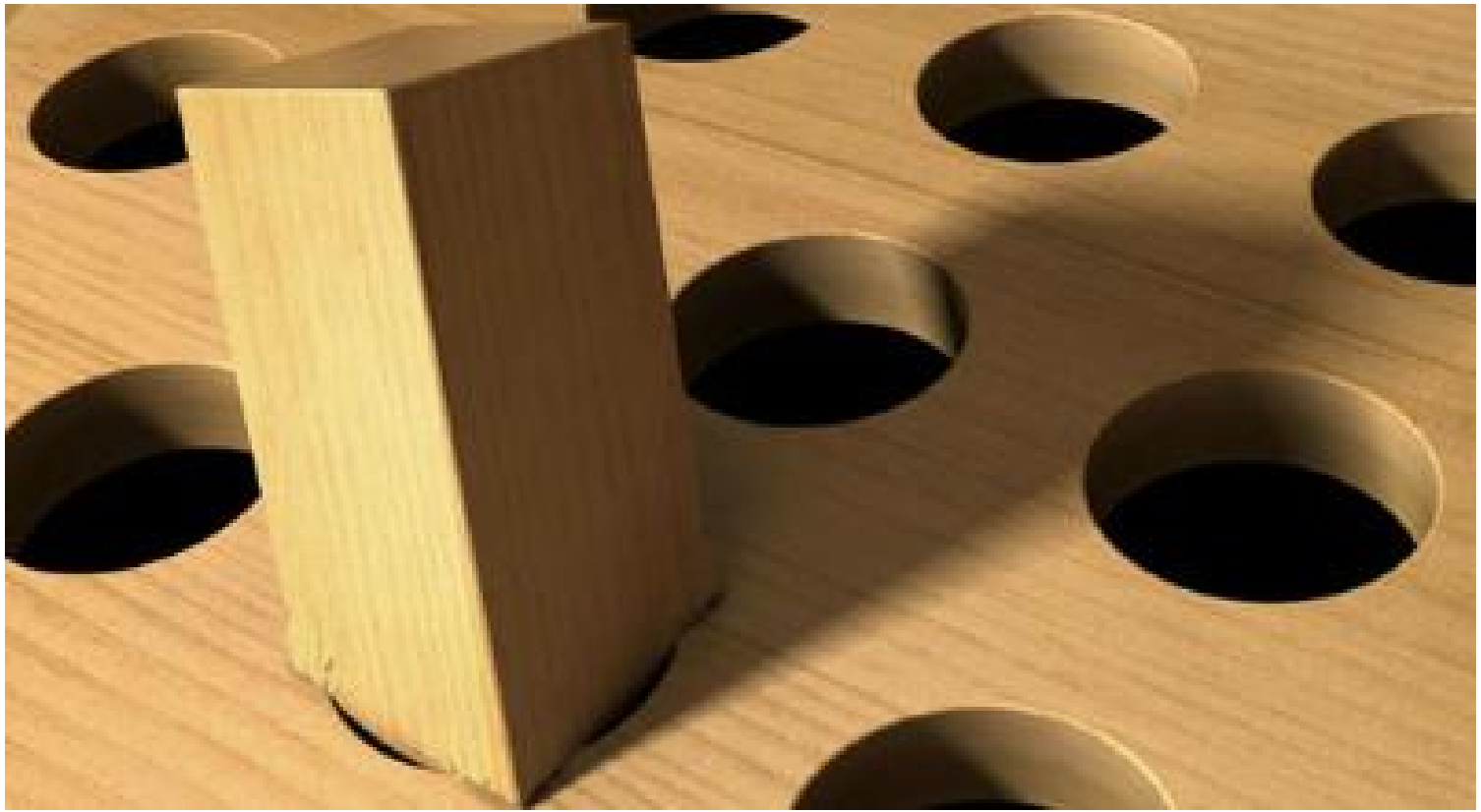
GPGPU-Sim



gem5



Merges are hard



Merges are difficult

Pointless name changes

```
-  out_port(reqToDirectory_out, RequestMsg, reqToDirectory,
desc="...");
+  out_port(requestToDir_out, RequestMsg, requestToDir, desc="...");
```

Functions disappear

```
-    Packet::reinitFromRequest()
-    {
-        assert(req->hasPaddr());
-        . . .
-    }
```

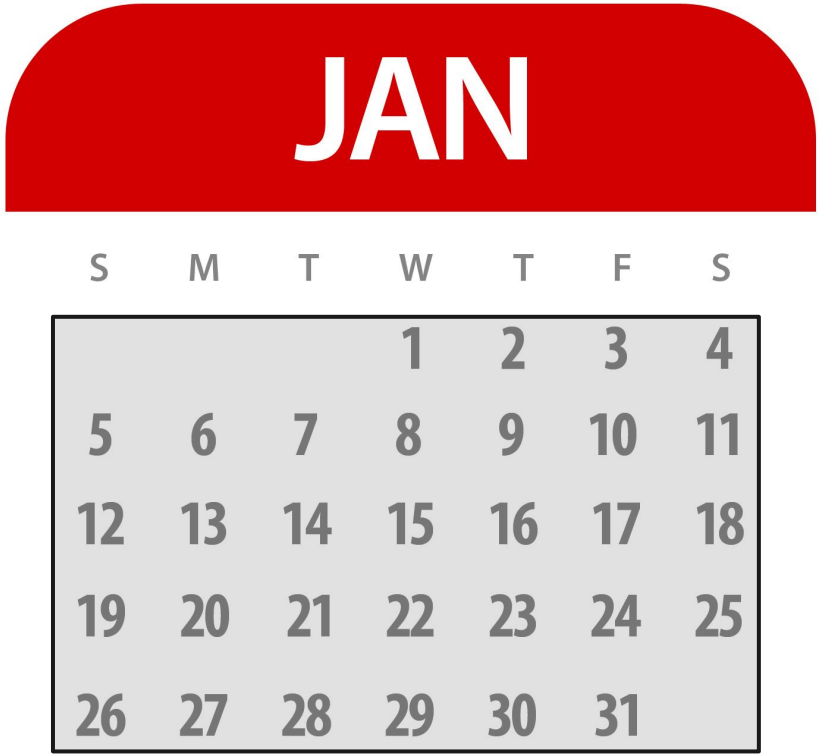
Merges are difficult

Ruby backing store

Checkpointing

O3 CPU and Ruby:

Merges are difficult



Sisyphean task

Story of a new user

normal

File Edit View Search Terminal Help

```
arch:
alpha/  arm/  generic/  isa_parser.py*  isa_parser.pyc  micro_asm.py  micro_asm.pyc  micro_asm_test.py*  mips/  null/  power/  SConscript  sparc/

base:
addr_range.hh      bigint.cc    bitunion.hh         circlebuf.cc    cp_annotate.hh      date.cc   flags.hh     inet.hh     loader/   output.cc
addr_range_map.hh  bigint.hh    callback.cc         circlebuf.hh    CPA.py              debug.cc  hashmap.hh   inifile.cc  match.cc  output.hh
atomicio.cc        bitfield.hh  callback.hh         compiler.hh     cprintf.cc          debug.hh  hostinfo.cc  inifile.hh  match.hh  pollevent.cc
atomicio.hh        bitmap.cc    cast.hh             condcodes.hh    cprintf_formats.hh  fenv.c    hostinfo.hh  intmath.cc  misc.cc   pollevent.hh
barrier.hh         bitmap.hh    chunk_generator.hh  cp_annotate.cc  cprintf.hh          fenv.hh   inet.cc      intmath.hh  misc.hh   printable.hh

cpu:
activity.cc            checker/          dummy_checker.hh  func_unit.hh      inteltrace.cc          minor/          pc_event.hh       reg_class.h
activity.hh            CheckerCPU.py     DummyChecker.py   FuncUnit.py       inteltrace.hh          nativetrace.cc  pred/             SConscript
base.cc                cpuevent.cc       exec_context.cc   inorder/          intr_control.cc        nativetrace.hh  profile.cc        simple/
BaseCPU.py             cpuevent.hh       exec_context.hh   inst_pb_trace.cc  intr_control.hh        nocpu/          profile.hh        simple_thre
base_dyn_inst.hh       CPUTracers.py     exetrace.cc       inst_pb_trace.hh  intr_control_noisa.cc  o3/             quiesce_event.cc  simple_thre
base_dyn_inst_impl.hh  decode_cache.hh   exetrace.hh       InstPBTrace.py    IntrControl.py         op_class.hh     quiesce_event.hh  smt.hh
base.hh                dummy_checker.cc  func_unit.cc      inst_seq.hh       kvm/                   pc_event.cc     reg_class.cc      static_inst

dev:
alpha/              copy_engine.hh  dma_device.hh  etherint.cc     etherpkt.hh     ide_ctrl.cc          intel_8254_timer.hh  mips/
arm/                CopyEngine.py   etherbus.cc    etherint.hh     ethertap.cc     ide_ctrl.hh          io_device.cc         ns_gige.cc
baddev.cc           Device.py       etherbus.hh    etherlink.cc    ethertap.hh     ide_disk.cc          io_device.hh         ns_gige.hh
baddev.hh           disk_image.cc   etherdevice.cc  etherlink.hh    i8254xGBe.cc    ide_disk.hh          isa_fake.cc          ns_gige_reg.h
BadDevice.py        disk_image.hh   etherdevice.hh  Ethernet.py     i8254xGBe_defs.hh  Ide.py            isa_fake.hh          pciconfigall.cc
copy_engine.cc      DiskImage.py    etherdump.cc    etherobject.hh  i8254xGBe.hh    ide_wdcreg.h         mc146818.cc          pciconfigall.hh
copy_engine_defs.hh  dma_device.cc  etherdump.hh    etherpkt.cc     ide_atareg.h    intel_8254_timer.cc  mc146818.hh          pcidev.cc

doc:
inside-minor.doxygen  memory_system.doxygen

doxygen:
footer.html  images/  stl.hh

kern:
kernel_stats.cc  kernel_stats.hh  linux/  operatingsystem.cc  operatingsystem.hh  SConscript  solaris/  system_events.cc  system_events.hh  tru64

mem:
abstract_mem.cc     coherent_xbar.cc  dramsim2.cc          ExternalSlave.py              MemObject.py                  packet.hh        port_pro
abstract_mem.hh     coherent_xbar.hh  dramsim2.hh          fs_translating_port_proxy.cc  mport.cc                      packet_queue.cc  protocol
AbstractMemory.py   comm_monitor.cc   DRAMSim2.py         fs_translating_port_proxy.hh  mport.hh                      packet_queue.hh  qport.hh
addr_mapper.cc      comm_monitor.hh   dramsim2_wrapper.cc  mem_checker.cc                multi_level_page_table.cc     page_table.cc    request.
addr_mapper.hh      CommMonitor.py    dramsim2_wrapper.hh  mem_checker.hh                multi_level_page_table.hh     page_table.hh    ruby/
AddrMapper.py       dram_ctrl.cc      external_master.cc   mem_checker_monitor.cc        multi_level_page_table_impl.hh  physical.cc    SConscri
bridge.cc           dram_ctrl.hh      external_master.hh   mem_checker_monitor.hh        noncoherent_xbar.cc           physical.hh      se_trans
bridge.hh           DRAMCtrl.py       ExternalMaster.py    MemChecker.py                 noncoherent_xbar.hh           port.cc          se_trans
Bridge.py           drampower.cc      external_slave.cc    mem_object.cc                 packet_access.hh              port.hh          simple_m
cache/              drampower.hh      external_slave.hh    mem_object.hh                 packet.cc                     port_proxy.cc    simple_m

proto:
inst.proto  packet.proto  protoio.cc  protoio.hh  SConscript
```

No info for beginning users

n26001482 via gem5-users | 6 Dec 14:55 2014

How and when to use the python?

Hi, all.

I found some Python files in the gem5/configs/common

But I don't understand how and when to use them.
So far the Python file I used is either se.py or fs.py.
Could anyone tell me?
Thanks a lot!

BEST

M.Y.

---

gem5-users mailing list

gem5-users <at> gem5.org

http://m5sim.org/cgi-bin/mailman/listinfo/gem5-users

Defaults are confusing

```
116     parser.add_option("--l1i_size", type="string", default="32kB")
117     parser.add_option("--l2_size", type="string", default="2MB")
118     parser.add_option("--l3_size", type="string", default="16MB")
119     parser.add_option("--l1d_assoc", type="int", default=2)
120     parser.add_option("--l1i_assoc", type="int", default=2)
121     parser.add_option("--l2_assoc", type="int", default=8)
122     parser.add_option("--l3_assoc", type="int", default=16)
123     parser.add_option("--cacheline_size", type="int", default=64)
124
```

Which trumps?

```
57  class L2Cache(BaseCache):
58      assoc = 8
59      hit_latency = 20
60      response_latency = 20
61      mshrs = 20
62      tgts_per_mshr = 12
63      write_buffers = 8
```

Defaults are confusing

```
113     parser.add_option("--num-l2caches", type="int", default=1)
114     parser.add_option("--num-l3caches", type="int", default=1)
115     parser.add_option("--l1d_size", type="string", default="64kB")
116     parser.add_option("--l1i_size", type="string", default="32kB")
117     parser.add_option("--l2_size", type="string", default="2MB")
118     parser.add_option("--l3_size", type="string", default="16MB")
```

```
 92     for i in xrange(options.num_clusters):
 93         for j in xrange(num_cpus_per_cluster):
 94             #
 95             # First create the Ruby objects associated with this cpu
 96             #
 97             l0i_cache = L0Cache(size = '4096B', assoc = 1, is_icache = True,
 98                 start_index_bit = block_size_bits, replacement_policy="LRU")
 99
100             l0d_cache = L0Cache(size = '4096B', assoc = 1, is_icache = False,
101                 start_index_bit = block_size_bits, replacement_policy="LRU")
102
```

Defaults are confusing

```
110     parser.add_option("--l2cache", action="store_true")
111     parser.add_option("--fastmem", action="store_true")
112     parser.add_option("--num-dirs", type="int", default=1)
113     parser.add_option("--num-l2caches", type="int", default=1)
114     parser.add_option("--num-l3caches", type="int", default=1)
115     parser.add_option("--l1d_size", type="string", default="64kB")
116     parser.add_option("--l1i_size", type="string", default="32kB")
117     parser.add_option("--l2_size", type="string", default="2MB")
118     parser.add_option("--l3_size", type="string", default="16MB")
119     parser.add_option("--l1d_assoc", type="int", default=2)
120     parser.add_option("--l1i_assoc", type="int", default=2)
121     parser.add_option("--l2_assoc", type="int", default=8)
122     parser.add_option("--l3_assoc", type="int", default=16)
123     parser.add_option("--cacheline_size", type="int", default=64)
124
```

No L3 caches are ever created!!

Et cetera

Ignore mailing list

December 2014: 41

Inconsistencies

See blog post

```
{
+ Y[i];
```

Division unit

	Latency	Issue rate	x86 perf	ARM perf
Config 1	10	10	1.0x	8.0x
Config 2	10	1	1.0x	9.6x (1.2x)

Expect nearly 10x

Addressing the “horrors”

Solutions

Merging headaches

➢ API Freezes & Improved regression coverage

Configuration complexity

➢ Fewer command-line options & more scripts

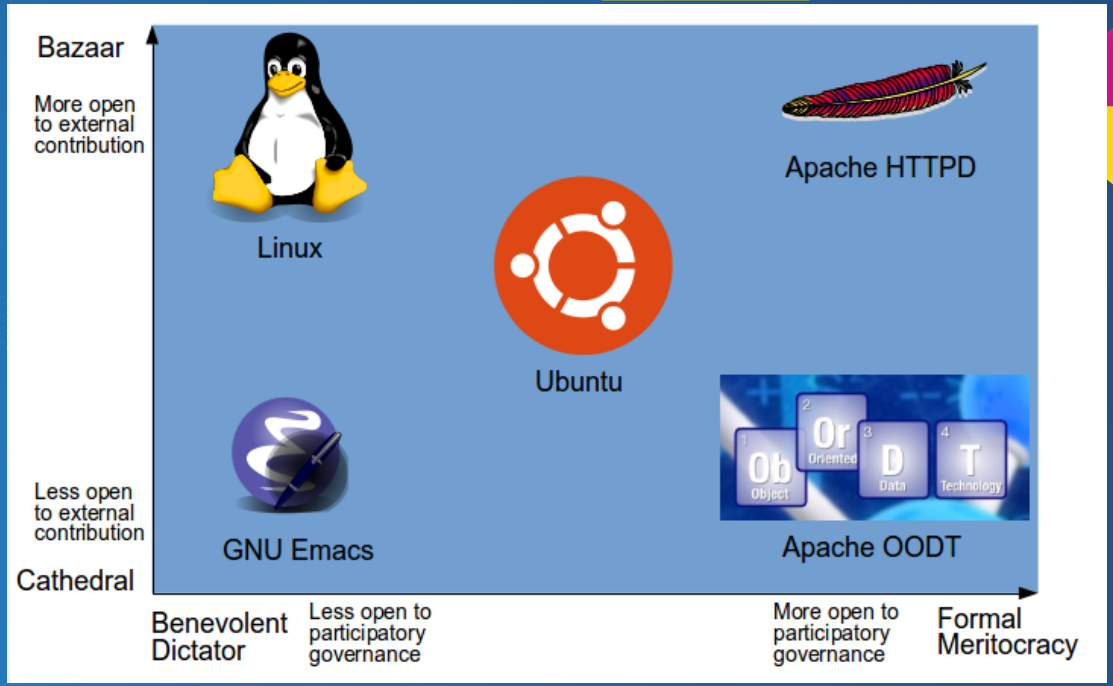
Lack of new user documentation

➢ Better documentation: gem5 for dummies

Community Organization

Linux

Community Organization



http://oss-watch.ac.uk/resources/governancemodels

gem5 Foundation

Advisory board

Conclusions

Discussion?

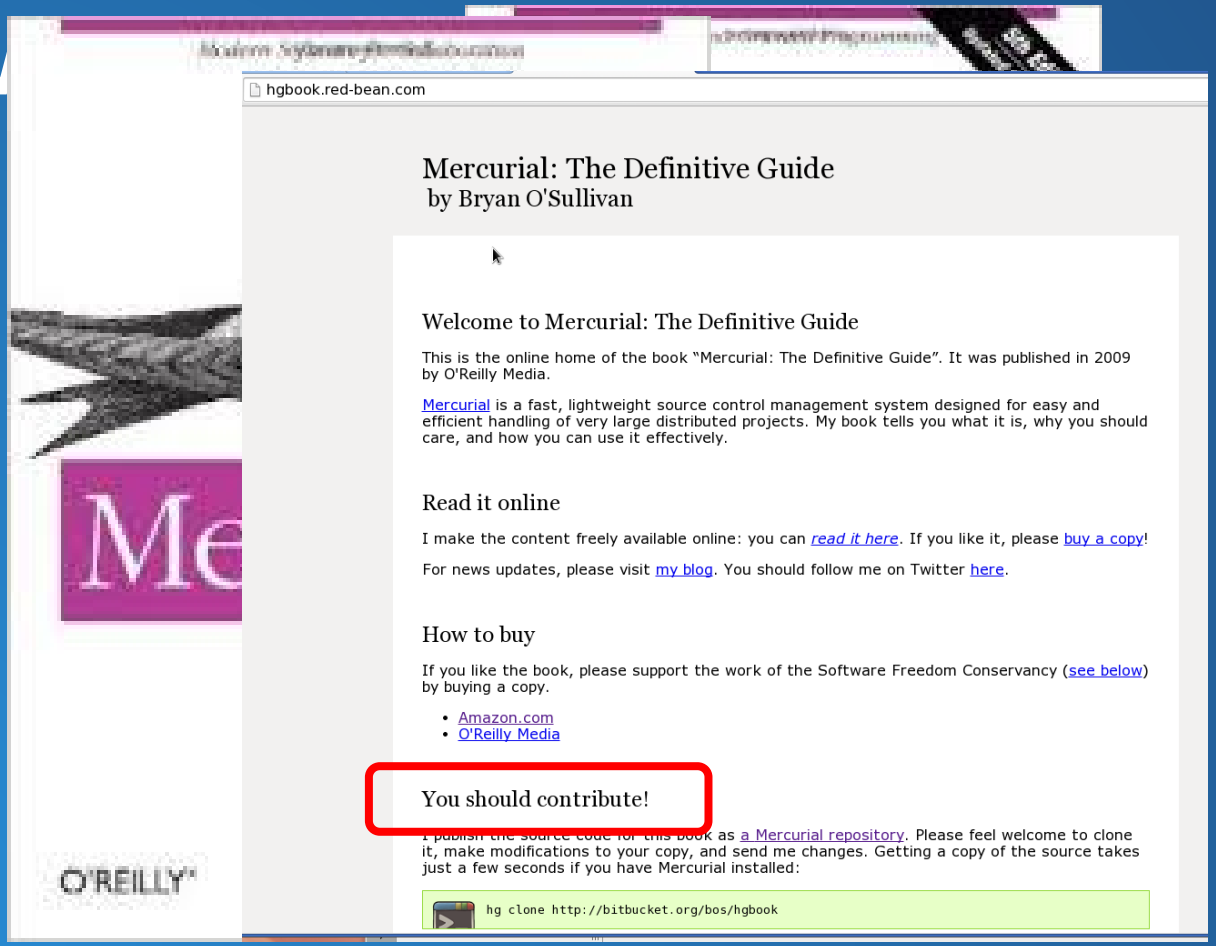
Backup/other slides

More money

Don’t make a PhD student do it
An architect isn’t the right person

We need to *pay* a real software developer

Nev


hgbook.red-bean.com
Mercurial: The Definitive Guide
by Bryan O'Sullivan
Welcome to Mercurial: The Definitive Guide
This is the online home of the book "Mercurial: The Definitive Guide". It was published in 2009 by O'Reilly Media.
Mercurial is a fast, lightweight source control management system designed for easy and efficient handling of very large distributed projects. My book tells you what it is, why you should care, and how you can use it effectively.
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O'Reilly Media
You should contribute!
a Mercurial repository. Please feel welcome to clone it, make modifications to your copy, and send me changes. Getting a copy of the source takes just a few seconds if you have Mercurial installed:
hg clone http://bitbucket.org/bos/hgbook
O'REILLY

Ignore mailing list

December 2014: 41 threads, 18 with no replies

Ignore mailing list

March 16, 2014:

Hi all! I encounter the error as following when I simulate ruby_fs.py on ALPHA…

March 17, 2014:

I am also facing the assertaion error which is described by

September 16, 2014:

I am using the latest stable version for x86+ruby+FS. I encountered the same assertion failure as the following email (posted in May)

January 6, 2015:

I recently ran into this and I saw several previous messages on the list about it without replies, so I figured I'd post a workaround (I'm not sure of the best way to do a real fix).

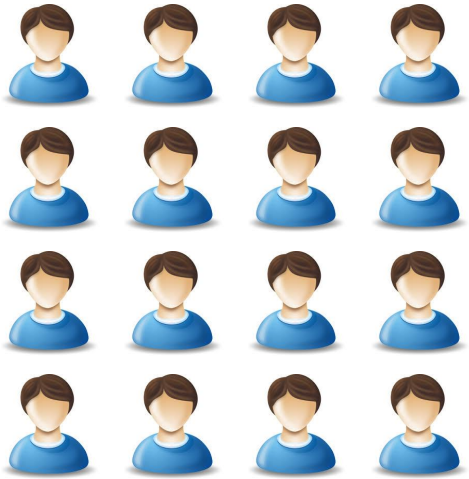
Merges are difficult

SLICC

Config files are complicated

More than 4000 lines of code in configs/

16 person-months



$250,000

Inconsistencies

Program:

```
for (int i = 0; i < N; i++) {
        Y[i] = X[i] / alpha + Y[i];
}
```

Division unit

	Latency	Issue rate	x86 perf	ARM perf
Config 1	10	10	1.0x	8.0x
Config 2	10	1	1.0x	9.6x (1.2x)

Expect nearly 10x

Code isn’t contributed back

the grail

30 seconds

gem5 Foundation