新增指令冲突测试

|  |  |  |  |
| --- | --- | --- | --- |
| 冲突位置 | 前序指令 | 后继指令 | 测试样例 |
| ALU | mtc0 | mfc0 | mtc0 $29 $14  mfc0 $28 $14 |
| mtc0 $29 $14  nop  mfc0 $28 $14 |
| mtc0 $29 $14  nop  nop  mfc0 $28 $14 |
| R-type(addu) | mtc0 | addu $4 $4 $5  mtc0 $4 $14 |
| addu $4 $4 $5  nop  mtc0 $4 $14 |
| addu $4 $4 $5  nop  nop  mtc0 $4 $14 |
| I-type(ori) | ori $4 $5 $6  mtc0 $4 $14 |
| ori $4 $5 $6  nop  mtc0 $4 $14 |
| ori $4 $5 $6  nop  nop  mtc0 $4 $14 |
| GRF | jal/jalr | jalr $5 $6  mtc0 $5 $14 |
| jalr $5 $6  nop  mtc0 $5 $14 |
| jalr $5 $6  nop  nop  mtc0 $5 $14 |
| load | lw $4 0($5)  mtc0 $4 $14 |
| lw $4 0($5)  nop  mtc0 $4 $14 |
| lw $4 0($5)  nop  nop  mtc0 $4 $14 |
| mfc0 | mfc0 $4 $14  mtc0 $4 $15 |
| mfc0 $4 $14  nop  mtc0 $4 $15 |
| mfc0 $4 $14  nop  nop  mtc0 $4 $15 |
| EPC | mtc0 | eret | mtc0 $29 $14  eret |
| mtc0 $29 $14  nop  eret |
| mtc0 $29 $14  nop  nop  eret |
| ALU | mfc0 | R-type(addu) | mfc0 $4 $14  addu $6 $4 $5 |
| mfc0 $4 $14  nop  addu $6 $4 $5 |
| mfc0 $4 $14  nop  nop  addu $6 $4 $5 |
| i-type(ori) | mfc0 $4 $14  ori $5 $4 0x1234 |
| mfc0 $4 $14  nop  ori $5 $4 0x1234 |
| mfc0 $4 $14  nop  nop  ori $5 $4 0x1234 |
| D | b-type(beq) | mfc0 $4 $14  beq $4 $5 label |
| mfc0 $4 $14  nop  beq $4 $5 label |
| mfc0 $4 $14  nop  nop  beq $4 $5 label |
| j-type | mfc0 $4 $14  jalr $5 $4 |
| mfc0 $4 $14  nop  jalr $5 $4 |
| mfc0 $4 $14  nop  nop  jalr $5 $4 |
| DM | store | mfc0 $4 $14  sw $4 0($5) |
| mfc0 $4 $14  nop  sw $4 0($5) |
| mfc0 $4 $14  nop  nop  sw $4 0($5) |
| ALU | mfc0 $4 $12  sw $5 0($4) |
| mfc0 $4 $12  nop  sw $5 0($4) |
| mfc0 $4 $12  nop  nop  sw $5 0($4) |
| load | mfc0 $4 $12  lw $5 0($4) |
| mfc0 $4 $12  nop  lw $5 0($4) |
| mfc0 $4 $12  nop  nop  lw $5 0($4) |

中断异常测试

|  |  |  |  |
| --- | --- | --- | --- |
| 类别 | 编码 | 描述 | 测试样例 |
| 取数异常 | 4 | 使用 lw 、 lh 、 lhu 这三种取数指令时，地址没有按照要求对齐 | ori $5 $0 0x0088  lw $10 1($5) |
|  |  | 使用 load 类指令时范围超出 0x0000~0x2ffc以及 0x7F00~0X7F0B 和 0x7F10~0X7F1B | ori $5 $0 0x7f0c  lw $12 0($5) |
|  |  | 使用 lh 、 lhu 、 lb 、 lbu 加载定时器中的值 | ori $5 $0 0x7f10  lh $12 0($5) |
| 存数异常 | 5 | 使用 sw 、 sh 这两种取数指令时，地址没有按照要求对齐 | ori $6 $0 0x0088  sw $5 1($6) |
|  |  | 使用 store 类指令时范围超出 0x0000~0x2ffc 以及 0x7F00~0X7F0B 和 0x7F10~0X7F1B | ori $6 $0 0x2fff  sw $5 0($6) |
|  |  | 试图往定时器的 COUNT 寄存器写入值 | ori $6 $0 0x7f08  sw $5 0($6) |
|  |  | 使用 sh 或 sb 向定时器写入值 | ori $6 $0 0x7f08  sh $5 0($6) |
| 溢出 | 12 | add溢出 | lui $4 0x7fff  add $4 $4 $4 |
|  |  | addi溢出 | ori $7 $0 0x7fffffff  addi $8 $7 1 |
|  |  | sub溢出 | lui $5 0x8000  ori $6 0x7fffffff  sub $7 $5 $6 |
|  |  | store 类要用到加法的情况如有溢出，不报 Ov 异常，而是报 AdES 异常。 | ori $7 $0 0x7fffffff  sw $7 1($7) |
|  |  | load 类要用到加法的情况如有溢出，不报 Ov 异常，而是报 AdEL 异常。 | ori $7 $0 0x7fffffff  lw $8 1($7) |
| 取指异常 | 4 | 取指超范围 0x3000~0x4ffc | ori $5 $0 0x2000  jalr $6 $5 |
|  |  | PC 值没有以 4 对齐  (如果 jr 到一个不对齐的地址，那么 EPC 的值应该为该地址，而非 jr 指令的 PC 值。**需要硬件对齐到00**) | ori $5 $0 0x3015  jalr $6 $5 |
|  | 10 | 不认识的非法指令 | msub $3 $4 |
| 延迟槽异常 | 12(以溢出为例) | 前序指令为b类型, CAUSE(BD)就会置位,EPC指向分支指令. | lui $4 0x7fff  beq $4 $4 label  add $5 $4 $4 |
|  |  | 前序指令为j |  |
|  |  | 前序指令为jal,jalr | lui $9 0xffff #label  jal label2  add $6 $4 $4 |
|  |  | 前序指令为jr |  |
| 乘除部件相关指令异常 |  | ????? |  |
| 模式0中断 | 0 | 程序开始时设置定时器的模式为模式0  进入中断后,停止计数,软件修改定时器设置为enable,再允许计数 |  |
| 模式1中断 | 0 | 程序开始时设置定时器的模式为模式1 |  |
| 定时器规范 | 无 | 在对定时器写入时不计数,不转移状态 |  |
| 屏蔽中断 | 忽视 | 在执行中断处理程序时,无视其他中断 |  |
| 屏蔽异常 | 忽视 | 在执行中断处理程序时,无视其他异常 |  |
| 中断优先 | 0 | 中断的优先级高于异常的优先级。即若有异常提交到 CP0 寄存器时，有中断发生，应先处理中断，并重新执行受害指令及其后续指令。若没有中断发生，则处理异常。 |  |
| eret+中断 | 0 | 异常处理程序刚退出时,若此时紧接中断,期望结果为EPC保存受害指令地址.再次进入中断处理程序. |  |
| CP0.SR.IE |  | CP0.SR全局中断使能关闭则无法进入中断 |  |
| CP0.SR.IM |  | CP0.SR开启中断屏蔽位则无法进入中断 |  |
| timer.IM |  | 计时器开启中断屏蔽位则无法产生中断 |  |

冲突测试

**测试1**

**测试点:all+mtc0**

9@00003000: $ 4 <= 00003020

11@00003004: $ 5 <= 00000008

13@00003008: $ 6 <= 00003028

13@0000300c: $CP0\_14 <= 00003028

21@00003018: $ 7 <= 00003030

23@00003020: $CP0\_14 <= 00003030

27@00003028: $CP0\_12 <= 00000000

33@00003030: $ 8 <= 00003038

37@0000303c: $CP0\_14 <= 00003038

47@0000304c: $ 9 <= 0000304c

47@00003050: $CP0\_14 <= 0000304c

57@00003060: $ 9 <= 00003048

59@00003068: $CP0\_14 <= 00003048

69@00003078: $ 9 <= 00003044

73@00003084: $CP0\_14 <= 00003044

77@00003088: $ 9 <= 00003040

79@0000308c: $10 <= 00000088

79@00003090: \*00000088 <= 00003040

83@00003094: $11 <= 00003040

83@00003098: $CP0\_14 <= 00003040

87@0000309c: $12 <= 00003050

87@000030a0: \*0000008c <= 00003050

95@000030ac: $13 <= 00003050

97@000030b4: $CP0\_14 <= 00003050

101@000030b8: $15 <= 00003054

101@000030bc: \*00000090 <= 00003054

109@000030c8: $16 <= 00003054

113@000030d4: $CP0\_14 <= 00003054

117@000030d8: $17 <= 000030e0

117@000030dc: $CP0\_14 <= 000030e0

119@00003028: $CP0\_12 <= 00003000

125@00003030: $ 8 <= 00003038

129@0000303c: $CP0\_14 <= 00003038

139@0000304c: $ 9 <= 0000304c

139@00003050: $CP0\_14 <= 0000304c

149@00003060: $ 9 <= 00003048

151@00003068: $CP0\_14 <= 00003048

161@00003078: $ 9 <= 00003044

165@00003084: $CP0\_14 <= 00003044

169@00003088: $ 9 <= 00003040

171@0000308c: $10 <= 00000088

171@00003090: \*00000088 <= 00003040

175@00003094: $11 <= 00003040

175@00003098: $CP0\_14 <= 00003040

179@0000309c: $12 <= 00003050

179@000030a0: \*0000008c <= 00003050

187@000030ac: $13 <= 00003050

189@000030b4: $CP0\_14 <= 00003050

193@000030b8: $15 <= 00003054

193@000030bc: \*00000090 <= 00003054

201@000030c8: $16 <= 00003054

205@000030d4: $CP0\_14 <= 00003054

209@000030d8: $17 <= 000030e0

209@000030dc: $CP0\_14 <= 000030e0

211@00003028: $CP0\_12 <= 00003000

217@00003030: $ 8 <= 00003038

...

测试2

**测试点: mfc0+mtc0,mtc0+mfc0**

9@00003000: $ 4 <= 00000123

9@00003004: $CP0\_14 <= 00000123

13@00003008: $ 5 <= 00000123

19@00003014: $ 6 <= 00001234

19@00003018: $CP0\_14 <= 00001234

25@00003020: $ 7 <= 00001234

33@00003030: $ 8 <= 00002345

33@00003034: $CP0\_14 <= 00002345

41@00003040: $ 9 <= 00002345

49@00003050: $10 <= 00002345

49@00003054: $CP0\_12 <= 00002001

59@00003064: $11 <= 00002345

61@0000306c: $CP0\_12 <= 00002001

71@0000307c: $12 <= 00002345

75@00003088: $CP0\_12 <= 00002001

测试3

**测试点: mfc0+all**

ori $4 $0 0x1234

mtc0 $4 $14

nop

nop

nop

nop

#addu

mfc0 $5 $14

addu $6 $5 $0

addu $7 $5 $0

addu $8 $5 $0

nop

nop

nop

nop

#ori

mfc0 $6 $14

ori $7 $6 0x2345

ori $8 $6 0x3456

ori $9 $6 0x4567

nop

nop

nop

nop

#beq

mfc0 $10 $14

beq $4 $10 label1

nop

nop

nop

nop

label1:

mfc0 $11 $14

nop

beq $4 $11 label2

nop

nop

nop

nop

label2:

mfc0 $12 $14

nop

nop

beq $12 $4 label3

nop

nop

nop

nop

label3:

#jalr

ori $13 $0 0x30c0

mtc0 $13 $14

mfc0 $14 $14

jalr $15 $14

nop

nop

nop

nop

ori $13 $0 0x30e8

mtc0 $13 $14

mfc0 $14 $14

nop

jalr $15 $14

nop

nop

nop

nop

ori $13 $0 0x3110

mtc0 $13 $14

mfc0 $14 $14

nop

nop

jalr $15 $14

nop

nop

#store rt

mfc0 $16 $14

sw $16 0($0)

nop

nop

nop

mfc0 $17 $14

nop

sw $17 4($0)

nop

nop

nop

mfc0 $18 $14

nop

nop

sw $18 8($0)

nop

nop

nop

nop

#store rs

ori $19 $0 0x0088

mtc0 $19 $14

mfc0 $20 $14

sw $19 0($20)

nop

addu $21 $20 $20

mtc0 $21 $14

mfc0 $22 $14

nop

sw $19 0($22)

nop

nop

nop

addu $23 $22 $20

mtc0 $23 $14

mfc0 $24 $14

nop

nop

sw $19 0($24)

#load

ori $19 $0 0x0088

mtc0 $19 $14

mfc0 $20 $14

lw $19 0($20)

nop

addu $21 $20 $20

mtc0 $21 $14

mfc0 $22 $14

nop

lw $19 0($22)

nop

nop

nop

addu $23 $22 $20

mtc0 $23 $14

mfc0 $24 $14

nop

nop

lw $19 0($24)

45@00003000: $ 4 <= 00001234

55@00003004: $CP0\_14 <= 00001234

105@00003018: $ 5 <= 00001234

115@0000301c: $ 6 <= 00001234

125@00003020: $ 7 <= 00001234

135@00003024: $ 8 <= 00001234

185@00003038: $ 6 <= 00001234

195@0000303c: $ 7 <= 00003375

205@00003040: $ 8 <= 00003676

215@00003044: $ 9 <= 00005777

265@00003058: $10 <= 00001234

305@00003070: $11 <= 00001234

345@0000308c: $12 <= 00001234

395@000030ac: $13 <= 000030c0

405@000030b0: $CP0\_14 <= 000030c0

415@000030b4: $14 <= 000030c0

435@000030b8: $15 <= 000030c0

485@000030cc: $13 <= 000030e8

495@000030d0: $CP0\_14 <= 000030e8

505@000030d4: $14 <= 000030e8

525@000030dc: $15 <= 000030e4

565@000030f0: $13 <= 00003110

575@000030f4: $CP0\_14 <= 00003110

585@000030f8: $14 <= 00003110

615@00003104: $15 <= 0000310c

635@00003110: $16 <= 00003110

635@00003114: \*00000000 <= 00003110

685@00003124: $17 <= 00003110

695@0000312c: \*00000004 <= 00003110

745@0000313c: $18 <= 00003110

765@00003148: \*00000008 <= 00003110

825@0000315c: $19 <= 00000088

835@00003160: $CP0\_14 <= 00000088

845@00003164: $20 <= 00000088

845@00003168: \*00000088 <= 00000088

875@00003170: $21 <= 00000110

885@00003174: $CP0\_14 <= 00000110

895@00003178: $22 <= 00000110

905@00003180: \*00000110 <= 00000088

955@00003190: $23 <= 00000198

965@00003194: $CP0\_14 <= 00000198

975@00003198: $24 <= 00000198

995@000031a4: \*00000198 <= 00000088

1015@000031a8: $19 <= 00000088

1025@000031ac: $CP0\_14 <= 00000088

1035@000031b0: $20 <= 00000088

1045@000031b4: $19 <= 00000088

1065@000031bc: $21 <= 00000110

1075@000031c0: $CP0\_14 <= 00000110

1085@000031c4: $22 <= 00000110

1105@000031cc: $19 <= 00000088

1145@000031dc: $23 <= 00000198

1155@000031e0: $CP0\_14 <= 00000198

1165@000031e4: $24 <= 00000198

1195@000031f0: $19 <= 00000088

测试4

**测试点: mtc0+eret**

.text//代码段

lui $7 0x7fff

add $7 $7 $7

ori $8 $7 0

ori $9 $7 0

ori $10 $7 0

//异常处理

#1

.ktext 0x4180

mfc0 $29, $14

addi $29, $29, 8

nop

nop

nop

mtc0 $29, $14

eret

#2

.ktext 0x4180

mfc0 $29, $14

addi $29, $29, 8

nop

nop

nop

mtc0 $29, $14

nop

eret

#3

.ktext 0x4180

mfc0 $29, $14

addi $29, $29, 8

nop

nop

nop

mtc0 $29, $14

nop

nop

eret

结果都是:

45@00003000: $ 7 <= 7fff0000

95@00004180: $29 <= 00003004

105@00004184: $29 <= 0000300c

145@00004194: $CP0\_14 <= 0000300c

175@0000300c: $ 9 <= 7fff0000

185@00003010: $10 <= 7fff0000

异常测试

测试1

测试点:溢出,且中断处理程序保存现场

9@00003000: $ 4 <= 7fff0000

19@00004180: $26 <= 00000030

21@00004184: $27 <= 00003004

23@00004188: $28 <= 00001800

25@0000418c: $29 <= 00002ffc

31@0000430c: $29 <= 00002f84

31@00004310: \*00002f84 <= 00000000

33@00004314: \*00002f88 <= 00000000

35@00004318: \*00002f8c <= 00000000

37@0000431c: \*00002f90 <= 7fff0000

39@00004320: \*00002f94 <= 00000000

41@00004324: \*00002f98 <= 00000000

43@00004328: \*00002f9c <= 00000000

45@0000432c: \*00002fa0 <= 00000000

47@00004330: \*00002fa4 <= 00000000

49@00004334: \*00002fa8 <= 00000000

51@00004338: \*00002fac <= 00000000

53@0000433c: \*00002fb0 <= 00000000

55@00004340: \*00002fb4 <= 00000000

57@00004344: \*00002fb8 <= 00000000

59@00004348: \*00002fbc <= 00000000

61@0000434c: \*00002fc0 <= 00000000

63@00004350: \*00002fc4 <= 00000000

65@00004354: \*00002fc8 <= 00000000

67@00004358: \*00002fcc <= 00000000

69@0000435c: \*00002fd0 <= 00000000

71@00004360: \*00002fd4 <= 00000000

73@00004364: \*00002fd8 <= 00000000

75@00004368: \*00002fdc <= 00000000

77@0000436c: \*00002fe0 <= 00000000

79@00004370: \*00002fe4 <= 00000000

81@00004374: \*00002ff0 <= 00001800

83@00004378: \*00002ff4 <= 00000000

85@0000437c: \*00002ff8 <= 00000000

93@00004198: $ 1 <= 80000000

95@0000419c: $ 1 <= 80000000

97@000041a0: $ 8 <= 00000000

105@000041b8: $ 8 <= 00000030

107@000041bc: $10 <= 00000030

115@000041fc: $ 1 <= 12120000

117@00004200: $16 <= 12121212

123@000042f4: $27 <= 00003008

123@000042f8: $CP0\_14 <= 00003008

131@00004388: $ 1 <= 00000000

133@0000438c: $ 2 <= 00000000

135@00004390: $ 3 <= 00000000

137@00004394: $ 4 <= 7fff0000

139@00004398: $ 5 <= 00000000

141@0000439c: $ 6 <= 00000000

143@000043a0: $ 7 <= 00000000

145@000043a4: $ 8 <= 00000000

147@000043a8: $ 9 <= 00000000

149@000043ac: $10 <= 00000000

151@000043b0: $11 <= 00000000

153@000043b4: $12 <= 00000000

155@000043b8: $13 <= 00000000

157@000043bc: $14 <= 00000000

159@000043c0: $15 <= 00000000

161@000043c4: $16 <= 00000000

163@000043c8: $17 <= 00000000

165@000043cc: $18 <= 00000000

167@000043d0: $19 <= 00000000

169@000043d4: $20 <= 00000000

171@000043d8: $21 <= 00000000

173@000043dc: $22 <= 00000000

175@000043e0: $23 <= 00000000

177@000043e4: $24 <= 00000000

179@000043e8: $25 <= 00000000

181@000043ec: $28 <= 00001800

183@000043f0: $31 <= 00000000

185@000043f4: $30 <= 00000000

187@000043f8: $29 <= 00002ffc

197@00003008: $ 9 <= ffff0000

199@0000300c: $10 <= ffff0000

201@00003010: $11 <= ffff0000

203@00003014: $12 <= ffff0000

205@00003018: $13 <= ffff0000

207@0000301c: $14 <= ffff0000

209@00003020: $ 5 <= 80000000

211@00003024: $ 1 <= 7fff0000

213@00003028: $ 1 <= 7fffffff

215@0000302c: $ 6 <= 7fffffff

225@00004180: $26 <= 00000030

227@00004184: $27 <= 00003030

229@00004188: $28 <= 00001800

231@0000418c: $29 <= 00002ffc

237@0000430c: $29 <= 00002f84

237@00004310: \*00002f84 <= ffff0000

239@00004314: \*00002f88 <= 00000000

241@00004318: \*00002f8c <= 00000000

243@0000431c: \*00002f90 <= 7fff0000

245@00004320: \*00002f94 <= 80000000

247@00004324: \*00002f98 <= 7fffffff

249@00004328: \*00002f9c <= 00000000

251@0000432c: \*00002fa0 <= 00000000

253@00004330: \*00002fa4 <= ffff0000

255@00004334: \*00002fa8 <= ffff0000

257@00004338: \*00002fac <= ffff0000

259@0000433c: \*00002fb0 <= ffff0000

261@00004340: \*00002fb4 <= ffff0000

263@00004344: \*00002fb8 <= ffff0000

265@00004348: \*00002fbc <= 00000000

267@0000434c: \*00002fc0 <= 00000000

269@00004350: \*00002fc4 <= 00000000

271@00004354: \*00002fc8 <= 00000000

273@00004358: \*00002fcc <= 00000000

275@0000435c: \*00002fd0 <= 00000000

277@00004360: \*00002fd4 <= 00000000

279@00004364: \*00002fd8 <= 00000000

281@00004368: \*00002fdc <= 00000000

283@0000436c: \*00002fe0 <= 00000000

285@00004370: \*00002fe4 <= 00000000

287@00004374: \*00002ff0 <= 00001800

289@00004378: \*00002ff4 <= 00000000

291@0000437c: \*00002ff8 <= 00000000

299@00004198: $ 1 <= 80000000

301@0000419c: $ 1 <= 80000000

303@000041a0: $ 8 <= 80000000

315@000041b4: $27 <= 00003034

317@000041b8: $ 8 <= 00000030

319@000041bc: $10 <= 00000030

327@000041fc: $ 1 <= 12120000

329@00004200: $16 <= 12121212

335@000042f4: $27 <= 00003038

335@000042f8: $CP0\_14 <= 00003038

343@00004388: $ 1 <= ffff0000

345@0000438c: $ 2 <= 00000000

347@00004390: $ 3 <= 00000000

349@00004394: $ 4 <= 7fff0000

351@00004398: $ 5 <= 80000000

353@0000439c: $ 6 <= 7fffffff

355@000043a0: $ 7 <= 00000000

357@000043a4: $ 8 <= 00000000

359@000043a8: $ 9 <= ffff0000

361@000043ac: $10 <= ffff0000

363@000043b0: $11 <= ffff0000

365@000043b4: $12 <= ffff0000

367@000043b8: $13 <= ffff0000

369@000043bc: $14 <= ffff0000

371@000043c0: $15 <= 00000000

373@000043c4: $16 <= 00000000

375@000043c8: $17 <= 00000000

377@000043cc: $18 <= 00000000

379@000043d0: $19 <= 00000000

381@000043d4: $20 <= 00000000

383@000043d8: $21 <= 00000000

385@000043dc: $22 <= 00000000

387@000043e0: $23 <= 00000000

389@000043e4: $24 <= 00000000

391@000043e8: $25 <= 00000000

393@000043ec: $28 <= 00001800

395@000043f0: $31 <= 00000000

397@000043f4: $30 <= 00000000

399@000043f8: $29 <= 00002ffc

409@00003038: $10 <= ffff0000

411@0000303c: $11 <= ffff0000

413@00003040: $12 <= ffff0000

415@00003044: $13 <= ffff0000

417@00003048: $14 <= ffff0000

419@0000304c: $ 1 <= 7fff0000

421@00003050: $ 1 <= 7fffffff

423@00003054: $ 7 <= 7fffffff

425@00003058: $ 8 <= 80000000

427@0000305c: $ 9 <= ffff0000

429@00003060: $10 <= ffff0000

431@00003064: $11 <= ffff0000

433@00003068: $12 <= ffff0000

435@0000306c: $13 <= ffff0000

437@00003070: $14 <= ffff0000

测试2

测试点:load 类异常, 中断处理程序仅pc+4,不保存现场

325@00004180: $26 <= 00003094

329@00004184: $26 <= 00003098

331@0000418c: $CP0\_14 <= 00003098

353@00004180: $26 <= 00003098

357@00004184: $26 <= 0000309c

359@0000418c: $CP0\_14 <= 0000309c

381@00004180: $26 <= 0000309c

385@00004184: $26 <= 000030a0

387@0000418c: $CP0\_14 <= 000030a0

401@000030a0: $ 5 <= 00007f00

403@000030a4: $12 <= 00000000

405@000030a8: $ 5 <= 00007f04

407@000030ac: $12 <= 00000000

409@000030b0: $ 5 <= 00007f08

411@000030b4: $12 <= 00000000

413@000030b8: $ 5 <= 00007f0c

423@00004180: $26 <= 000030bc

427@00004184: $26 <= 000030c0

429@0000418c: $CP0\_14 <= 000030c0

443@000030c0: $ 5 <= 00007f10

453@00004180: $26 <= 000030c4

457@00004184: $26 <= 000030c8

459@0000418c: $CP0\_14 <= 000030c8

481@00004180: $26 <= 000030c8

485@00004184: $26 <= 000030cc

487@0000418c: $CP0\_14 <= 000030cc

509@00004180: $26 <= 000030cc

513@00004184: $26 <= 000030d0

515@0000418c: $CP0\_14 <= 000030d0

537@00004180: $26 <= 000030d0

541@00004184: $26 <= 000030d4

543@0000418c: $CP0\_14 <= 000030d4

测试3

测试点:store类异常,中断处理程序仅pc+4,不保存现场

9@00003000: $ 1 <= 12340000

11@00003004: $ 1 <= 12345678

13@00003008: $ 5 <= 12345678

15@0000300c: $ 6 <= 00000088

15@00003010: \*00000088 <= 12345678

27@00004180: $26 <= 00003014

31@00004184: $26 <= 00003018

33@0000418c: $CP0\_14 <= 00003018

55@00004180: $26 <= 00003018

59@00004184: $26 <= 0000301c

61@0000418c: $CP0\_14 <= 0000301c

83@00004180: $26 <= 0000301c

87@00004184: $26 <= 00003020

89@0000418c: $CP0\_14 <= 00003020

101@00003020: \*0000008c <= 12345678

103@00003024: \*00000088 <= 12345678

115@00004180: $26 <= 00003028

119@00004184: $26 <= 0000302c

121@0000418c: $CP0\_14 <= 0000302c

133@0000302c: \*00000088 <= 56785678

145@00004180: $26 <= 00003030

149@00004184: $26 <= 00003034

151@0000418c: $CP0\_14 <= 00003034

163@00003034: \*0000008c <= 12345678

165@00003038: \*00000088 <= 56785678

167@0000303c: \*00000088 <= 56787878

169@00003040: \*00000088 <= 56787878

171@00003044: \*00000088 <= 78787878

173@00003048: \*0000008c <= 12345678

177@0000304c: $ 6 <= 00002fff

187@00004180: $26 <= 00003050

191@00004184: $26 <= 00003054

193@0000418c: $CP0\_14 <= 00003054

215@00004180: $26 <= 00003054

219@00004184: $26 <= 00003058

221@0000418c: $CP0\_14 <= 00003058

243@00004180: $26 <= 00003058

247@00004184: $26 <= 0000305c

249@0000418c: $CP0\_14 <= 0000305c

263@0000305c: $ 6 <= 00007f00

275@00004180: $26 <= 00003064

279@00004184: $26 <= 00003068

281@0000418c: $CP0\_14 <= 00003068

303@00004180: $26 <= 00003068

307@00004184: $26 <= 0000306c

309@0000418c: $CP0\_14 <= 0000306c

323@0000306c: $ 6 <= 00007f04

327@00003074: $ 6 <= 00007f08

337@00004180: $26 <= 00003078

341@00004184: $26 <= 0000307c

343@0000418c: $CP0\_14 <= 0000307c

357@0000307c: $ 6 <= 00007f0c

367@00004180: $26 <= 00003080

371@00004184: $26 <= 00003084

373@0000418c: $CP0\_14 <= 00003084

387@00003084: $ 6 <= 00007f10

391@0000308c: $ 6 <= 00007f14

395@00003094: $ 6 <= 00007f18

405@00004180: $26 <= 00003098

409@00004184: $26 <= 0000309c

411@0000418c: $CP0\_14 <= 0000309c

425@0000309c: $ 6 <= 00007f1c

435@00004180: $26 <= 000030a0

439@00004184: $26 <= 000030a4

测试4

测试点:

|  |
| --- |
| store 类要用到加法的情况如有溢出，不报 Ov 异常，而是报 AdES 异常。 |
| load 类要用到加法的情况如有溢出，不报 Ov 异常，而是报 AdEL 异常。 |

9@00003000: $ 1 <= 7fff0000

11@00003004: $ 1 <= 7fffffff

13@00003008: $ 7 <= 7fffffff

23@00004180: $26 <= 00000002

25@00004184: $26 <= 00000014

27@00004188: $26 <= 0000300c

31@0000418c: $26 <= 00003010

33@00004194: $CP0\_14 <= 00003010

45@00003010: \*00000000 <= 7fffffff

57@00004180: $26 <= 00000002

59@00004184: $26 <= 00000010

61@00004188: $26 <= 00003014

65@0000418c: $26 <= 00003018

67@00004194: $CP0\_14 <= 00003018

81@00003018: $ 9 <= ffff0000

测试5

测试点:jalr超范围

9@00003000: $ 5 <= 00002000

13@00003004: $ 6 <= 0000300c

25@00004180: $26 <= 00000002

27@00004184: $26 <= 00000010

29@00004188: $26 <= 00002000

31@0000418c: $26 <= 0000300c

33@00004194: $CP0\_14 <= 0000300c

测试6

测试点:jalr/jr未对齐

9@00003000: $ 5 <= 00003003

25@00004180: $26 <= 00000002

27@00004184: $26 <= 00000010

29@00004188: $26 <= 00003000

33@0000418c: $26 <= 00003008

35@00004194: $CP0\_14 <= 00003008

51@0000300c: $ 5 <= 00003015

55@00003010: $ 6 <= 00003018

67@00004180: $26 <= 00000002

69@00004184: $26 <= 00000010

71@00004188: $26 <= 00003014

75@0000418c: $26 <= 0000301c

77@00004194: $CP0\_14 <= 0000301c

测试7

测试点:beq 超范围,未对齐

测试8

测试点:非法指令

9@00003000: $ 4 <= 00001234

19@00004180: $26 <= 00000002

21@00004184: $26 <= 00000028#cause=0x28为非法指令

23@00004188: $26 <= 00003004

27@0000418c: $26 <= 00003008

29@00004194: $CP0\_14 <= 00003008

测试9

测试点:延迟槽溢出异常

9@00003000: $ 4 <= 7fff0000

23@00004180: $26 <= 00000002

25@00004184: $26 <= 80000030

27@00004188: $26 <= 00003004

31@0000418c: $26 <= 0000300c

33@00004194: $CP0\_14 <= 0000300c

53@00003018: $ 9 <= ffff0000

55@0000301c: $31 <= 00003024

65@00004180: $26 <= 00000002

67@00004184: $26 <= 80000030

69@00004188: $26 <= 0000301c

73@0000418c: $26 <= 00003024

75@00004194: $CP0\_14 <= 00003024

95@00003030: $10 <= ffff0000

测试10

测试点:乘除部件相关指令异常

中断测试

测试1

测试点:定时器模式0中断,模式1中断.在对定时器写入时不计数,在执行中断处理程序时,无视其他中断

9@00003000: $ 4 <= 00004c01

9@00003004: $CP0\_12 <= 00004c01

13@00003008: $ 4 <= 0000000c

15@0000300c: $20 <= 00007f00

19@00003014: $ 4 <= 00000009

23@0000301c: $ 4 <= 0000000c

25@00003020: $21 <= 00007f10

29@00003028: $ 4 <= 0000000a

33@00003030: $ 5 <= abcd0000

35@00003034: $ 5 <= abcd0000

37@00003038: $ 5 <= abcd0000

39@0000303c: $ 5 <= abcd0000

41@00003040: $ 5 <= abcd0000

43@00003044: $ 4 <= 0000000c

45@00003048: $20 <= 00007f00

49@00003050: $ 4 <= 0000000c

51@00003054: $21 <= 00007f10

61@00004180: $26 <= 00004c03

63@00004184: $26 <= 00000400

65@00004188: $26 <= 00003058

69@0000418c: $26 <= 0000305c

71@00004194: $CP0\_14 <= 0000305c

77@0000419c: $ 4 <= 0000000e

79@000041a0: $20 <= 00007f00

83@000041a8: $ 4 <= 00000009

87@000041b0: $ 4 <= 0000000e

89@000041b4: $21 <= 00007f10

93@000041bc: $ 4 <= 0000000a

105@0000305c: $ 5 <= abcd0000

107@00003060: $ 5 <= abcd0000

109@00003064: $ 5 <= abcd0000

111@00003068: $ 5 <= abcd0000

113@0000306c: $ 5 <= abcd0000

115@00003070: $ 5 <= abcd0000

117@00003074: $ 5 <= abcd0000

127@00004180: $26 <= 00004c03

129@00004184: $26 <= 00000400

131@00004188: $26 <= 00003078

135@0000418c: $26 <= 0000307c

137@00004194: $CP0\_14 <= 0000307c

143@0000419c: $ 4 <= 0000000e

145@000041a0: $20 <= 00007f00

149@000041a8: $ 4 <= 00000009

153@000041b0: $ 4 <= 0000000e

155@000041b4: $21 <= 00007f10

159@000041bc: $ 4 <= 0000000a

171@0000307c: $ 5 <= abcd0000

173@00003080: $ 5 <= abcd0000

175@00003084: $ 5 <= abcd0000

177@00003088: $ 5 <= abcd0000

179@0000308c: $ 5 <= abcd0000

181@00003090: $ 5 <= abcd0000

183@00003094: $ 5 <= abcd0000

193@00004180: $26 <= 00004c03

195@00004184: $26 <= 00000400

197@00004188: $26 <= 00003098

201@0000418c: $26 <= 0000309c

203@00004194: $CP0\_14 <= 0000309c

209@0000419c: $ 4 <= 0000000e

211@000041a0: $20 <= 00007f00

215@000041a8: $ 4 <= 00000009

219@000041b0: $ 4 <= 0000000e

221@000041b4: $21 <= 00007f10

225@000041bc: $ 4 <= 0000000a

237@0000309c: $ 5 <= abcd0000

239@000030a0: $ 5 <= abcd0000

241@000030a4: $ 5 <= abcd0000

243@000030a8: $ 5 <= abcd0000

245@000030ac: $ 5 <= abcd0000

247@000030b0: $ 5 <= abcd0000

249@000030b4: $ 5 <= abcd0000

259@00004180: $26 <= 00004c03

261@00004184: $26 <= 00000400

263@00004188: $26 <= 000030b8

267@0000418c: $26 <= 000030bc

269@00004194: $CP0\_14 <= 000030bc

275@0000419c: $ 4 <= 0000000e

277@000041a0: $20 <= 00007f00

281@000041a8: $ 4 <= 00000009

285@000041b0: $ 4 <= 0000000e

287@000041b4: $21 <= 00007f10

291@000041bc: $ 4 <= 0000000a

303@000030bc: $ 5 <= abcd0000

305@000030c0: $ 5 <= abcd0000

307@000030c4: $ 5 <= abcd0000

309@000030c8: $ 5 <= abcd0000

311@000030cc: $ 5 <= abcd0000

313@000030d0: $ 5 <= abcd0000

315@000030d4: $ 5 <= abcd0000

325@00004180: $26 <= 00004c03

327@00004184: $26 <= 00000400

329@00004188: $26 <= 000030d8

333@0000418c: $26 <= 000030dc

335@00004194: $CP0\_14 <= 000030dc

341@0000419c: $ 4 <= 0000000e

343@000041a0: $20 <= 00007f00

347@000041a8: $ 4 <= 00000009

351@000041b0: $ 4 <= 0000000e

353@000041b4: $21 <= 00007f10

357@000041bc: $ 4 <= 0000000a

369@000030dc: $ 5 <= abcd0000

371@000030e0: $ 5 <= abcd0000

373@000030e4: $ 5 <= abcd0000

375@000030e8: $ 5 <= abcd0000

377@000030ec: $ 5 <= abcd0000

379@000030f0: $ 5 <= abcd0000

381@000030f4: $ 5 <= abcd0000

391@00004180: $26 <= 00004c03

393@00004184: $26 <= 00000400

395@00004188: $26 <= 000030f8

399@0000418c: $26 <= 000030fc

401@00004194: $CP0\_14 <= 000030fc

407@0000419c: $ 4 <= 0000000e

409@000041a0: $20 <= 00007f00

413@000041a8: $ 4 <= 00000009

417@000041b0: $ 4 <= 0000000e

419@000041b4: $21 <= 00007f10

423@000041bc: $ 4 <= 0000000a

435@000030fc: $ 5 <= abcd0000

…

测试2.0

测试点: 在执行中断处理程序时,无视其他异常(无需支持嵌套异常)

45@00003000: $ 4 <= 00004c01

45@00003004: $CP0\_12 <= 00004c01

65@00003008: $ 4 <= 0000000c

75@0000300c: $20 <= 00007f00

95@00003014: $ 4 <= 00000009

115@0000301c: $ 5 <= abcd0000

125@00003020: $ 5 <= abcd0000

135@00003024: $ 5 <= abcd0000

145@00003028: $ 5 <= abcd0000

155@0000302c: $ 5 <= abcd0000

165@00003030: $ 5 <= abcd0000

175@00003034: $ 5 <= abcd0000

185@00003038: $ 5 <= abcd0000

195@0000303c: $ 5 <= abcd0000

205@00003040: $ 5 <= abcd0000

215@00003044: $ 5 <= abcd0000

225@00003048: $ 5 <= abcd0000

235@0000304c: $ 5 <= abcd0000

245@00003050: $ 5 <= abcd0000

295@00004180: $26 <= 00004c03

305@00004184: $26 <= 00000400

315@00004188: $26 <= 00003054

335@0000418c: $26 <= 00003058

345@00004194: $CP0\_14 <= 00003058

375@0000419c: $ 4 <= 0000000e

385@000041a0: $20 <= 00007f00

405@000041a8: $ 4 <= 00000009

425@000041b0: $ 7 <= 7fff0000

435@000041b4: $ 7 <= fffe0000

455@000041bc: $ 7 <= 00000000

515@00003058: $ 5 <= abcd0000

525@0000305c: $ 5 <= abcd0000

535@00003060: $ 5 <= abcd0000

545@00003064: $ 5 <= abcd0000

555@00003068: $ 5 <= abcd0000

565@0000306c: $ 5 <= abcd0000

575@00003070: $ 5 <= abcd0000

625@00004180: $26 <= 00004c03

635@00004184: $26 <= 00000400

645@00004188: $26 <= 00003074

665@0000418c: $26 <= 00003078

675@00004194: $CP0\_14 <= 00003078

705@0000419c: $ 4 <= 0000000e

715@000041a0: $20 <= 00007f00

735@000041a8: $ 4 <= 00000009

755@000041b0: $ 7 <= 7fff0000

765@000041b4: $ 7 <= fffe0000

785@000041bc: $ 7 <= 00000000

845@00003078: $ 5 <= abcd0000

855@0000307c: $ 5 <= abcd0000

865@00003080: $ 5 <= abcd0000

875@00003084: $ 5 <= abcd0000

885@00003088: $ 5 <= abcd0000

895@0000308c: $ 5 <= abcd0000

905@00003090: $ 5 <= abcd0000

955@00004180: $26 <= 00004c03

965@00004184: $26 <= 00000400

975@00004188: $26 <= 00003094

995@0000418c: $26 <= 00003098

测试3

测试点:中断优先

.text

ori $4 $0 0x4c01

mtc0 $4 $12

ori $4 $0 0xc

ori $20 $0 0x7f00

sw $4 4($20)

ori $4 $0 9 #1001 im=1,mode=00,enable=1

sw $4 0($20)

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $6 0x7fff

add $6 $6 $6

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

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lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

.ktext 0x4180

\_main\_handler:

mfc0 $k0, $12

mfc0 $k0, $13

mfc0 $k0, $14 #\_main\_handler

addi $k0 $k0 0

nop

mtc0 $k0, $14

nop

ori $4 $0 0xe

ori $20 $0 0x7f00

sw $4 4($20)

ori $4 $0 9 #1001 im=1,mode=00,enable=1

sw $4 0($20)

j \_restore

nop

\_restore:

eret #\_restore

45@00003000: $ 4 <= 00004c01

45@00003004: $CP0\_12 <= 00004c01

65@00003008: $ 4 <= 0000000c

75@0000300c: $20 <= 00007f00

95@00003014: $ 4 <= 00000009

115@0000301c: $ 5 <= abcd0000

125@00003020: $ 5 <= abcd0000

135@00003024: $ 5 <= abcd0000

145@00003028: $ 5 <= abcd0000

155@0000302c: $ 5 <= abcd0000

165@00003030: $ 5 <= abcd0000

175@00003034: $ 5 <= abcd0000

185@00003038: $ 5 <= abcd0000

195@0000303c: $ 5 <= abcd0000

205@00003040: $ 5 <= abcd0000

215@00003044: $ 5 <= abcd0000

225@00003048: $ 5 <= abcd0000

235@0000304c: $ 5 <= abcd0000

245@00003050: $ 5 <= abcd0000

255@00003054: $ 6 <= 7fff0000

305@00004180: $26 <= 00004c03

315@00004184: $26 <= 00000000 #cause=0x00,而非0x30

325@00004188: $26 <= 00003058

345@0000418c: $26 <= 00003058

355@00004194: $CP0\_14 <= 00003058

385@0000419c: $ 4 <= 0000000e

395@000041a0: $20 <= 00007f00

415@000041a8: $ 4 <= 00000009

515@00004180: $26 <= 00004c03

525@00004184: $26 <= 00000030 #cause=0x30

535@00004188: $26 <= 00003058

555@0000418c: $26 <= 00003058

565@00004194: $CP0\_14 <= 00003058

595@0000419c: $ 4 <= 0000000e

605@000041a0: $20 <= 00007f00

625@000041a8: $ 4 <= 00000009

725@00004180: $26 <= 00004c03

735@00004184: $26 <= 00000030

745@00004188: $26 <= 00003058

765@0000418c: $26 <= 00003058

775@00004194: $CP0\_14 <= 00003058

45@00003000: $ 4 <= 00004c01

45@00003004: $CP0\_12 <= 00004c01

65@00003008: $ 4 <= 0000000c

75@0000300c: $20 <= 00007f00

95@00003014: $ 4 <= 00000009

115@0000301c: $ 5 <= abcd0000

125@00003020: $ 5 <= abcd0000

135@00003024: $ 5 <= abcd0000

145@00003028: $ 5 <= abcd0000

155@0000302c: $ 5 <= abcd0000

165@00003030: $ 5 <= abcd0000

175@00003034: $ 5 <= abcd0000

185@00003038: $ 5 <= abcd0000

195@0000303c: $ 5 <= abcd0000

205@00003040: $ 5 <= abcd0000

215@00003044: $ 5 <= abcd0000

225@00003048: $ 5 <= abcd0000

235@0000304c: $ 5 <= abcd0000

245@00003050: $ 6 <= 7fff0000

295@00004180: $26 <= 00004c03

305@00004184: $26 <= 00000430

315@00004188: $26 <= 00003054

335@0000418c: $26 <= 00003058

345@00004194: $CP0\_14 <= 00003058

375@0000419c: $ 4 <= 0000000e

385@000041a0: $20 <= 00007f00

405@000041a8: $ 4 <= 00000009

465@00003058: $ 5 <= abcd0000

475@0000305c: $ 5 <= abcd0000

485@00003060: $ 5 <= abcd0000

495@00003064: $ 5 <= abcd0000

505@00003068: $ 5 <= abcd0000

515@0000306c: $ 5 <= abcd0000

525@00003070: $ 5 <= abcd0000

535@00003074: $ 5 <= abcd0000

545@00003078: $ 5 <= abcd0000

555@0000307c: $ 5 <= abcd0000

565@00003080: $ 5 <= abcd0000

575@00003084: $ 5 <= abcd0000

625@00004180: $26 <= 00004c03

635@00004184: $26 <= 00000400

645@00004188: $26 <= 00003088

665@0000418c: $26 <= 0000308c

675@00004194: $CP0\_14 <= 0000308c

705@0000419c: $ 4 <= 0000000e

715@000041a0: $20 <= 00007f00

735@000041a8: $ 4 <= 00000009

795@0000308c: $ 5 <= abcd0000

805@00003090: $ 5 <= abcd0000

815@00003094: $ 5 <= abcd0000

825@00003098: $ 5 <= abcd0000

835@0000309c: $ 5 <= abcd0000

845@000030a0: $ 5 <= abcd0000

855@000030a4: $ 5 <= abcd0000

865@000030a8: $ 5 <= abcd0000

875@000030ac: $ 5 <= abcd0000

885@000030b0: $ 5 <= abcd0000

895@000030b4: $ 5 <= abcd0000

905@000030b8: $ 5 <= abcd0000

955@00004180: $26 <= 00004c03

965@00004184: $26 <= 00000400

975@00004188: $26 <= 000030bc

995@0000418c: $26 <= 000030c0

测试4

测试点:eret+中断

**#第一次中断时eret在M级,第二次中断时eret在E级**

.text

ori $4 $0 0x4c01

mtc0 $4 $12

ori $4 $0 0xe

ori $20 $0 0x7f00

sw $4 4($20)

ori $4 $0 10

sw $4 0($20)

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $6 0x7fff

add $6 $6 $6

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

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lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

.ktext 0x4180

\_main\_handler:

mfc0 $k0, $12

mfc0 $k0, $13

mfc0 $k0, $14 #\_main\_handler

addi $k0 $k0 4

nop

mtc0 $k0, $14

nop

ori $4 $0 0xe

ori $20 $0 0x7f00

sw $4 4($20)

lui $7 0x7fff

add $7 $7 $7

eret #\_restore

45@00003000: $ 4 <= 00004c01

45@00003004: $CP0\_12 <= 00004c01

65@00003008: $ 4 <= 0000000e

75@0000300c: $20 <= 00007f00

95@00003014: $ 4 <= 0000000a

115@0000301c: $ 5 <= abcd0000

125@00003020: $ 5 <= abcd0000

135@00003024: $ 5 <= abcd0000

145@00003028: $ 5 <= abcd0000

155@0000302c: $ 5 <= abcd0000

165@00003030: $ 5 <= abcd0000

175@00003034: $ 5 <= abcd0000

185@00003038: $ 5 <= abcd0000

195@0000303c: $ 5 <= abcd0000

205@00003040: $ 5 <= abcd0000

215@00003044: $ 5 <= abcd0000

225@00003048: $ 5 <= abcd0000

235@0000304c: $ 5 <= abcd0000

245@00003050: $ 5 <= abcd0000

255@00003054: $ 6 <= 7fff0000

305@00004180: $26 <= 00004c03

315@00004184: $26 <= 00000030

325@00004188: $26 <= 00003058

345@0000418c: $26 <= 0000305c

355@00004194: $CP0\_14 <= 0000305c

385@0000419c: $ 4 <= 0000000e

395@000041a0: $20 <= 00007f00

415@000041a8: $ 7 <= 7fff0000

425@000041ac: $ 7 <= fffe0000

475@00004180: $26 <= 00004c03

485@00004184: $26 <= 00000000

495@00004188: $26 <= 0000305c

515@0000418c: $26 <= 00003060

525@00004194: $CP0\_14 <= 00003060

555@0000419c: $ 4 <= 0000000e

565@000041a0: $20 <= 00007f00

585@000041a8: $ 7 <= 7fff0000

595@000041ac: $ 7 <= fffe0000

635@00004180: $26 <= 00004c03

645@00004184: $26 <= 00000000

655@00004188: $26 <= 00003060

675@0000418c: $26 <= 00003064

685@00004194: $CP0\_14 <= 00003064

**#中断时eret在D级,没有再次进入中断处理程序**

.text

ori $4 $0 0x4c01

mtc0 $4 $12

ori $4 $0 0xe

ori $20 $0 0x7f00

sw $4 4($20)

ori $4 $0 10

sw $4 0($20)

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $6 0x7fff

add $6 $6 $6

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

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lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

lui $5 0xabcd

.ktext 0x4180

\_main\_handler:

mfc0 $k0, $12

mfc0 $k0, $13

mfc0 $k0, $14 #\_main\_handler

addi $k0 $k0 4

nop

mtc0 $k0, $14

nop

ori $4 $0 0xe

ori $20 $0 0x7f00

sw $4 4($20)

ori $4 $0 10

nop

lui $7 0x7fff

add $7 $7 $7

eret #\_restore

45@00003000: $ 4 <= 00004c01

45@00003004: $CP0\_12 <= 00004c01

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225@00003048: $ 5 <= abcd0000

235@0000304c: $ 5 <= abcd0000

245@00003050: $ 5 <= abcd0000

255@00003054: $ 6 <= 7fff0000

305@00004180: $26 <= 00004c03

315@00004184: $26 <= 00000030

325@00004188: $26 <= 00003058

345@0000418c: $26 <= 0000305c

355@00004194: $CP0\_14 <= 0000305c

385@0000419c: $ 4 <= 0000000e

395@000041a0: $20 <= 00007f00

415@000041a8: $ 4 <= 0000000a

435@000041b0: $ 7 <= 7fff0000

445@000041b4: $ 7 <= fffe0000

475@0000305c: $ 5 <= abcd0000

485@00003060: $ 5 <= abcd0000

495@00003064: $ 5 <= abcd0000

505@00003068: $ 5 <= abcd0000

515@0000306c: $ 5 <= abcd0000

525@00003070: $ 5 <= abcd0000