DSM interrupt loads

Gordon, Nov 29

ssh'd into the systems, and checked the interrupt rates With the "intcount" command.

On vipers and titans, ttyS1, 2 and 3 are the serial ports on the CPU board. On both systems ttyS1 is served by interrupt 37, ttyS2 by interrupt 36. On vipers, ttyS3 is interrupt 116. On titans, ttyS3 is interrupt 122

The Emerald serial expansion board(s), serving serial ports ttyS5 to tty12 (and ttyS13-ttyS20 on m21) are configured to use ISA interrupt 3. The PC104 interrupts (in this case just IRQ 3) get multiplexed by a CPLD on the CPU board into a GPIO interrupt. On vipers, the PC104/GPIO interrupt is number 25, GPIO line 01. On titans, the PC104/GPIO interrupt is number 129, on GPIO 17.

Interrupts/second

DSM	CPU	ID#'s (top/middle /bottom)	Emerald	ttyS5-20, IRQ 3	PC104 /GPIO	ttyS2, IRQ 36	ttyS1, IRQ 37	ttyS3 IRQ 116/122	USB	kernel	notes
a1	V2		8P 330002	150-900	150-900	20	3.2	20	1018	2.6.35.9-ael1-1-viper Sep 14 10:54: 19 MDT 2012	1,3
a2	V6	607-00655-005-106-39-01857 Rev I Dec04 SN: W250043 Rev G Jun09 SN: W327962		5.4	5.4	20	3	20	1019	2.6.35.9-ael1-1-viper Sep 14 10:54: 19 MDT 2012	3
a3	T7	6570-00703-002-101-39-00481 Rev I May04 SN: W241864 Rev M Jan01 SN: W390480	8X 241864	18.8	18.8	20	2		13.4	2.6.35.9-ael1-2-titan Oct 13 12:45: 33 MDT 2012	
a4	T5 /T1	6570-00703-002-101-39-00088 Rev C Aug09 SN: W329992 Rev H Jul12 SN:441913				20	3	4	13.4	2.6.35.9-ael1-2-titan Sep 14 11:29: 27 MDT 2012	
a5	V13	607-00655-005-106-39-02050 Rev C Aug09 SN: W329987 Rev G Dec08 SN: W317328	8P W329987	2300-3900	2300-3900	20	3	20	1020	2.6.35.9-ael1-1-viper Oct 4 13:21:09 MDT 2012	1,3
a6	V14	607-00655-005-106-39-02003 Rev I May04 SN: W242045 Rev E May04 SN:W240 (9?)44		5.4	5.4	20	3	20	1044	2.6.35.9-ael1-1-viper Sep 14 10:54: 19 MDT 2012	3
a7	T11	6570-00703-002-101-39-00495 (no middle) Rev M Nov09 SN: W388778				20	2	4	15	2.6.35.9-ael1-2-titan Sep 14 11:29: 27 MDT 2012	
a8	V12		8P W274095	1500-2550	1500-2550	20	2	20	1020	2.6.35.9-ael1-1-viper Sep 14 10:54: 19 MDT 2012	1,3
a9	V1	607-00655-005-106-39-01994 Rev C Aug09 SN: W329969 Rev F Jan06 “A1501P1”				20	2	20	1020	2.6.35.9-ael1-1-viper Sep 14 10:54: 19 MDT 2012	3
a10	V9		8P W274177			20	13	20	1020	2.6.35.9-ael1-1-viper Sep 14 10:54: 19 MDT 2012	3
a11	T16	6570-00703-002-101-39-01006 (no middle) Rev M Nov09 SN: W388781				20	3	4	18.6	2.6.35.9-ael1-2-titan Sep 14 11:29: 27 MDT 2012	
a12	T12	6570-00703-002-101-39-00519 (no middle) Rev F Jan 06 (no serial)				20	2	3	15.6	2.6.35.9-ael1-2-titan Sep 14 11:29: 27 MDT 2012	
a13	T9	6570-00703-002-101-39-00493 (no middle) Rev M Jan01 SN: W390510				20	3	4	12.8	2.6.35.9-ael1-2-titan Sep 14 11:29: 27 MDT 2012	
a14	V16	607-00655-005-106-39-01841 Rev C Aug09 SN: W329990 Rev E Sep04 SN: W246380	8P 329990			20	3	20	1020	2.6.35.9-ael1-1-viper Sep 14 10:54: 19 MDT 2012	3
a15	T6	6570-00703-002-101-39-00477 Rev B Aug06 SN: W274092 Rev M Jan01 SN: W390486				20	3	4	13.2	2.6.35.9-ael1-2-titan Sep 14 11:29: 27 MDT 2012	

a16	T8	6570-00703-002-101-39-00482 (no middle) Rev M Jan01 SN: W390479				20	3	4	13.4	2.6.35.9-ael1-2-titan Sep 14 11:29:27 MDT 2012	
a17	T14	6570-00703-002-101-39-00521 (no middle) Rev M Jan01 SN: W390497				20	3	4	18.2	2.6.35.9-ael1-2-titan Sep 14 11:29:27 MDT 2012	
a18	T15	6570-00703-002-101-39-00522 (no middle) Rev G Dec08 SN: W317315				20	3	4	13.8	2.6.35.9-ael1-2-titan Sep 14 11:29:27 MDT 2012	
a19	T13	6570-00703-002-101-39-00520 (no middle) (no bottom)				20	3	4	14.6	2.6.35.9-ael1-2-titan Sep 14 11:29:27 MDT 2012	
c20	V11	607-00655-005-106-39-01995 Rev H Apr04 SN: W240067 Rev G Dec08 SN: W317334		52	52	3	2	20	7.2	2.6.35.9-ael1-1-viper Sep 14 10:54:19 MDT 2012	4
m21		607-00655-005-106-39-01999 (couldn't read 2 middle boards) Rev E Oct04 SN: W248073		350	6000-17500	3	21	20	14	2.6.35.9-ael1-1-viper Oct 3 12:12:46 MDT 2012	1,2,4
m22	T3		8P 330000	64	64	2	3		3	2.6.35.9-ael1-2-titan Oct 2 21:50:26 MDT 2012	4

Notes:
1: These vipers have large anomalous pc104 interrupt rates, which occur with both Sep 14 (a1,a8) and the Oct 4 (a5) kernels.
2: Not completely sure why on m21 the IRQ3 rate is less than the pc104 load. I may have installed a kernel on that system with a pc104 irq routine that exits if pending bits are 0, instead of attempting to serve he unmasked interrupts.
3: High USB interrupts are seen on vipers with bluetooth radios interfaced via USB. High USB interrupts are not seen on Titans, even though on "A" site titans, USB serves both the bluetooth radios and flash drives. On "A" site Vipers, USB has only bluetooth radios. Viper USB driver is isp116x_hcd. Titan USB driver is ohci_hcd.
4: On c20,m21, m22, USB is used only for flash drives

The big question is why the huge PC104 interrupt rates on vipers at a1, a5, a8 and m21. Previously traced this to a floating CTS/RTS line, but I'm not sure that is the current reason. Saw high PC104 interrupt rate on m21 even with the ribbon cables disconnected from the Emerald headers! Will have to investigate those systems back in the lab.

The only titans with PC104 serial are a3 and m22. They're both OK.

PC104 interrupts for vipers at a2, a6 and c20 are OK.

USB Interrupts

The viper kernel has a patch to use an assembler delay function for the isp116x, and not the kernel ndelay() function. It is not known whether this is related to the high interrupt rate. An incorrect delay may result in the USB interface completely failing.

The driver code that sets up the interrupt, uses two configuration values, int_act_high and int_edge_triggered, which are used to configure the interface:

```
if (board->int_act_high)
                val |= HCHWCFG_INT_POL;
        if (board->int_edge_triggered)
                val |= HCHWCFG_INT_TRIGGER;
```

The current isp116x driver is configured for level triggered (int_edge_triggered=0, default) and active high (int_act-high=1) interrupts. However, the setting for the corresponding GPIO interrupt is IORESOURCE_IRQ_HIGHEDGE. This might mean the interrupt is not being acknowledged correctly.

8.6.1 Pin configuration

The interrupt output signals have four configuration modes:

- Level trigger, active LOW
- Level trigger, active HIGH
- Edge trigger, active LOW
- Edge trigger, active HIGH.

Figure 20 shows these four interrupt configuration modes. They are programmable through register settings, which are also used to disable or enable the signals.

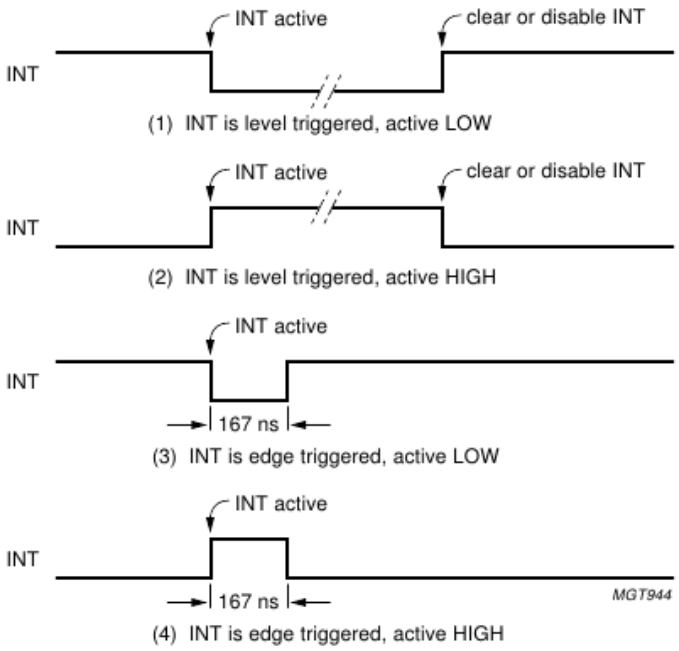

Fig 20. Interrupt pin operating modes.

Planned Testing

- Figure out what might be causing the high PC104 interrupt load on some vipers. By swapping cards and looking at IRQ3 level on a scope, figure out whether the problem is associated with the Emerald serial cards, or some of the Vipers, or is related to the RS232 connections.
- Try various USB interrupt configurations on Vipers and see if we can get the USB interrupt rate to drop, while sending data through a USB Bluetooth radio at data rates that were used at SCP. Could this be related to the issue of data corruption on USB flash drives that we see on Vipers, when two or more USB devices are connected?