Xen and the linux console

why xencons={tty,ttyS,xvc} will go away.
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What is the Linux console?

- Answering this question is the point of this talk ...
- For most users it probably is the screen they are sitting in front of.
- The linux kernel has two different (but related) subsystems.
- Both have a bunch of CONFIG_*_CONSOLE config options
Virtual Terminals (CONFIG_VT)

- Using Alt-Fx users can switch between different terminals on the same physical screen.
- Each terminal has its own device: /dev/tty<nr>.
- Most Linux distros have getty's running on /dev/tty{1-6}, the X-Server uses /dev/tty7.
- /dev/tty0: The terminal which is visible at the moment.
- The VT subsystem needs a hardware specific drivers for actual output.
VT drivers (incomplete)

- **CONFIG_VGA_CONSOLE**
  - Drives VGA card in text mode.

- **CONFIG_FRAMEBUFFER_CONSOLE**
  - Provides text screens on top of a graphical display.
  - The graphical display is handled by some fb driver: vesafb (generic), matroxfb, pvfb (xen), ...

- **CONFIG_DUMMY_CONSOLE**
  - Used when no other driver is present.
  - Solves initialization order issues and usually runs for a short time at boot only.
Introducing /dev/console

- /dev/console is the linux console device.
- The kernel messages (printk) will go to the console device.
- The kernel boots /sbin/init with /dev/console as terminal.
- Often linked to /dev/tty0.
  - One reason for the confusion ...
  - That is only one option though.
  - Especially there is no strong connection between virtual terminals and /dev/console.
About Console drivers

• There are two kinds of console drivers:
  – Some can just print messages.
  – The others are associated with a full-featured terminal.

• The earlyprintk code is just a console driver too.
  – quite limited, print-only, no mem alloc for early boot operation.
Console driver list (#1)

- **CONFIG_VT_CONSOLE**
  - Console on virtual terminals. Most popular one.

- **CONFIG_SERIAL_*_CONSOLE**
  - Console on a serial line.

- **CONFIG_LP_CONSOLE**
  - Print your kernel messages on paper.

- **CONFIG_NETCONSOLE**
  - Send messages to a log server.
Console driver list (#2)

- **CONFIG_HVC_CONSOLE**
  - Hypervisor console infrastructure.
  - Two simple functions to send and receive characters are needed.
  - You'll get a full-featured terminal device.
  - Created by the powerpc folks.

- There are a lot more console drivers, most of them are architecture-specific.
XenLinux console, sparse tree (#1)

• It is a terminal driver, registers as console (aka /dev/console).

• It can hijack the console (aka VT subsystem) major/minor number range (xencons=tty).
  – Default on guest domains.
  – Convenient, gives getty without extra config.
  – Using virtual terminals at the same time is impossible. Showstopper for pvfb.
  – Code must deal with hijack fallout (emulate /dev/tty{2..8}).
XenLinux console, sparse tree (#2)

- It can also hijack the serial line major/minor numbers (xencons=ttYS)
  - Default on the control domain.
  - Makes it impossible for the dom0 kernel to use the serial line directly.

- Recent (3.0.4+) drivers can use the xen console major/minor number (xencons=xvc).
  - YES! Make it the default NOW!
  - Needs some manual config (stay tuned) until distros do it for you.
  - No conflicts with other drivers.
XenLinux console, paravirt_ops

- Remember CONFIG_HVC_CONSOLE?
- The xen console code in the paravirt_ops patch queue just uses that.
- Very few lines of code, the infrastructure in hvc_console.c handles the interfacing with other parts of the kernel for us.
- xencons= is gone. The console device is /dev/hvc0.
The Linux kernel can have (and usually has) multiple console devices compiled in.

- Who registers first is the default console.
- Initialization order is link order, drivers/Makefile decides which console driver becomes default.
- Can be overwritten on the kernel command line using console=name,options.
- Multiple consoles can be specified, printk goes to all consoles, /dev/console is linked to the last one.
Linux console config, examples

• `console=ttyS0,115200n8`
  - Classic way to setup a serial console.
• `xencons=xvc console=xvc0`
  - 3.0.4+ sparse kernels, without virtual framebuffer.
• `xencons=xvc console=xvc0 console=tty1`
  - 3.0.4+ sparse kernels, when using the framebuffer.
• `console=hvc0`
  - paravirt_ops kernels.
Linux console config, userspace

- Start a getty on /dev/hvc0 (or /dev/xvc0) for login.
  - Edit /etc/inittab (usually has a commented serial console sample line)
    h0:12345:respawn:/sbin/agetty -L 9600 hvc0 screen
  - Add hvc0 to /etc/securetty for root logins.

- /dev/hvc0 is present even when not configured as console.
  - No boot messages then of course.
  - But getty's friendly login prompt will show nevertheless.
That's it. Questions?