Porting Minix3 to x86-based platforms

Ralf Neeb
AppliedAppliance GmbH
How to install Minix3

- "Official" approach
  - Take an ISO and use an ATAPI/SATA optical drive

- Our approach
  - Use the image being generated by x86_hdimage.sh
  - Image was initially meant for QEMU only
    - Contained no boot loaders
    - Status today: the image is bootable!

- Time to make it an “official” alternative
  - Nice side effect: Boot the ramdisk via USB!
LP-172

- Intel NM 10 express chipset
- Atom D2550 (64bit, 2 core)
- Up to 4 GB RAM
- Intel 82583V LAN
- VGA, SATA
- serial port, (U|E)HCI, PS/2
- 100mm x 72mm
How to install it?

- Create an image
  - Write it to a SATA disk (via SATA/USB)
- Boot!
  - Serial works out of the box (its not self-evident!)
  - netconf (e1000)
- Keyboard, serial and network is working!

=> Device ID of Intel NIC was not there
ALIX2D3

AMD Geode LX 800
CS 5536 chipset
IDE CF Card
3 VIA Rhine NICs
(O|E)HCI & serial
TinyBIOS
152,4 mm x 152,4 mm
How to install it?

• Create an image
  – Write it to a CF card

• Boot!
  – Serial works
  – PCI & PCKBD panic's, ATA w/o DMA

• Fixes
  – Assumed PCI HC no longer at 0:0:0 (no standard)
  – Remove panic for missing keyboard, safeguard rc
  – Adding Alix option to boot loader
APU1D4

AMD G series T40E, 1 GHz
2/4 GB RAM
SD card (USB-MSD)
3 Realtek 8111E NICs
(O|E)HCI & serial
Coreboot
152,4 mm x 152,4 mm
How to install it?

- Create an image
  - Write it to a SSD (size depends on your image)
- Boot!
  - Serial works
- Fixes
  - Nothing to fix, already made for ALIX
  - Big question: SSD without TRIM?
MinnowBoard MAX

Intel Atom E3825, dual core, 64 bit, Bay Trail chipset
2 GB DDR3 soldered
SDIO, SATA
Realtek 8111GS-CG
EHCI & XHCI
HSE (2x serial), 1 debug uart
99 mm x 74 mm
How to install it?

- Create an image
  - Write it to a SATA disk (find power for SATA)
- Boot!
  - Saw the bootloader, nothing else!
  - PCI serial, BIOS VGA calls, serial RTS/CTS
- Fixes
  - Flashing coreboot
  - Switch RTS/CTS on/off
  - For UEFI: getting rid of VGA BIOS calls
IB-897

Intel Atom E3845
64bit, quad core
Bay trail
2 x Intel i210 series
NICs
(E|X)HCI & serial
102 mm x 147 mm
How to install it?

- Create an image
  - Write it to a SATA disk
- Boot!
  - Serial works out of the box, UEFI with CS
  - No keyboard (→ USB)
- Serial is working
  → i210 series seems to be a new family?
  → USB is underway for HID
# Current Status

<table>
<thead>
<tr>
<th></th>
<th>SATA/IDE</th>
<th>Keyboard</th>
<th>Network</th>
<th>Serial(LS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALIX</td>
<td>✔</td>
<td>-</td>
<td>❌</td>
<td>✔</td>
</tr>
<tr>
<td>APU</td>
<td>✔</td>
<td>-</td>
<td>❌</td>
<td>✔</td>
</tr>
<tr>
<td>IB-897</td>
<td>✔</td>
<td>❌</td>
<td>❌</td>
<td>✔</td>
</tr>
<tr>
<td>LP-172</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Minnowboard</td>
<td>✔</td>
<td>❌</td>
<td>❌</td>
<td>✔</td>
</tr>
</tbody>
</table>
Resume (1/2)

- No major change needed (kernel → vga text)
- Streamlining the boot process would help
  - UEFI, BIOS
- Next target: Intel ComputeStick, NUC
Resume (2/2)

- Very few 32bit CPUs still available
- Very few single core CPUs available
- Target architecture
  - Bus: PCI Express, XHCI/USB3, SDHC, SMBUS
  - 64bit (instruction set & memory)
  - Multicore (maybe AMP instead of SMP?)
- We are working on buses & devices
How to contact

https://www.linkedin.com/in/ralfneeb