

# Embedding Junkie

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<http://people.freebsd.org/~imp/talks/embed-junk.pdf>

# Releases

- FreeBSD 2.2.8 + PAO
- FreeBSD 3.1 - SNAP
- FreeBSD 3.4
- FreeBSD 4.2
- FreeBSD 4.5
- FreeBSD 4.9
- FreeBSD 5.2
- FreeBSD 6.2

# Hardware

- x86 hardware on an ISA bus
- Custom ISA hardware
- High Precision Timing Systems
- Lately Atmel AT91RM9200 based hardware

# Old- School Hardware



Modular



- x86 SBC
- 486, Pentium 166
- ISA add-in cards
- RS-232 monitor
- CF in TrueIDE
- Timing system
- FreeBSD 4, 5, 6
- 4U Rack mount
- <http://www.timing.com>

# Newer School



New 2U combo system  
Insert pictures here

- Still x86 SBC
- Pentium II, etc
- PCI
- Lots of custom H/W
- 2U ½ wide
- DIO
- FreeBSD 4, 6

# Sexy Instruments



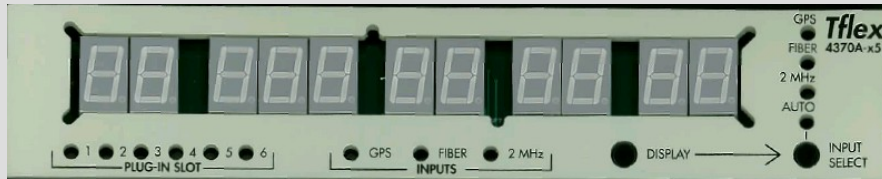
- x86 SBC & DSP
- ISA based
- Pentium II class
- Custom kb if
- Simple Instrument
- Easy to Use

# Network Time Servers



- NTP Server
- PPS from GPS/ Rb through Parallel Port
- PPS, Irig, 5MHz
- FreeBSD 5.2, 6.2

# FreeBSD ARM System



- 1U
- Hot Plug
- Low Power
- FreeBSD/ arm
- AT91RM9200
- SD
- Network Update
- Modular
- Timing Systems
- Kwikbyte + 3 boards



# Sample Boot

```
boot: MAC 62:73:64:69:6d:70

Default: /boot/kernel/kernel.gz.tramp 1 second
boot:
KDB: debugger backends: ddb 3 seconds
KDB: current backend: ddb
Copyright (c) 1992-2007 The FreeBSD Project.
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The Regents of the University of California. All rights reserved.
FreeBSD 7.0-CURRENT #6: Fri Mar 23 17:22:54 MDT 2007
  imp@lighthouse:/tmp/imp/obj/arm/hp/imp/FreeBSD/src/sys/KB920X
CPU: ARM920T rev 0 (ARM9TDMI core)
  IC enabled IC enabled WB enabled LABT
  16KB/32B 64-way Instruction cache
  16KB/32B 64-way write-back-locking=A Data cache
real memory = 33554432 (32 MB)
avail memory = 29581312 (28 MB)
atmelarm0: <AT91 device bus> on motherboard
at91_st0: <ST> mem 0xdffffd00-0xdffffdff irq 1 on atmelarm0
at91_st0: watchdog registered, timeout interval max. 64 sec
at91_pio0: <PIOA> mem 0xdffff400-0xdffff5ff irq 1 on atmelarm0
at91_pio0: ABSR: 0x60 ODR: 0 PSR:0x138001f ODSR: 0
at91_pio0: [FILTER]
at91_pio1: <PIOB> mem 0xdffff600-0xdffff7ff irq 1 on atmelarm0
at91_pio1: ABSR: 0xff338 ODR: 0 PSR:0x3fc00cc7 ODSR: 0
at91_pio1: [FILTER]
at91_pio2: <PIOC> mem 0xdffff800-0xdffff9ff irq 1 on atmelarm0
at91_pio2: ABSR: 0 ODR: 0x1c0000 PSR:0xffffc07f ODSR: 0x180000
at91_pio2: [FILTER]
at91_pio3: <PIOD> mem 0xdffffa00-0xdffffbfff irq 1 on atmelarm0
at91_pio3: ABSR: 0 ODR: 0 PSR:0xffffffff ODSR: 0
at91_pio3: [FILTER]
at91_pmc0: <PMC> mem 0xdffffc00-0xdffffcfff irq 1 on atmelarm0
at91_pmc0: Primary: 10000000 Hz PLLA: 180 MHz CPU: 180 MHz MCK: 60 MHz
at91_mci0: <MCI mmc/sd host bridge> mem 0xdffb4000-0xdffb7fff irq 10 on atmelarm0
at91_mci0: [ITHREAD]
mmc0: <mmc/sd bus> on at91_mci0
at91_twi0: <TWI> mem 0xdffb8000-0xdffbffff irq 12 on atmelarm0
at91_twi0: [ITHREAD]
iicbus0: <Philips I2C bus> on at91_twi0
setting cwgr to 0x1a4a4
iicbus0: <unknown card> at addr 0
iic0: <I2C generic I/O> on iicbus0
icee0: <I2C EEPROM> at addr 0xa0 on iicbus0
ate0: <EMAC> mem 0xdffbc000-0xdffbffff irq 24 on atmelarm0
miibus0: <MII bus> on ate0
ukphy0: <Generic IEEE 802.3u media interface> PHY 0 on miibus0
ukphy0: 10baseT, 10baseT-FDX, 100baseTX, 100baseTX-FDX, auto
ate0: Ethernet address: 62:73:64:69:6d:70
ate0: [ITHREAD]
uart0: <DBGU> mem 0xdffff200-0xdffff3ff irq 1 on atmelarm0
uart0: console (115200,n,8,1)
uart1: <USART0> mem 0xdffc0000-0xdffc3fff irq 6 on atmelarm0
uart1: [FILTER]
uart2: <USART1> mem 0xdffc4000-0xdffc7fff irq 7 on atmelarm0
uart2: [FILTER]
```

```
at91_mci0: Setting controller bus width to 1
SD CARD: 513277952 bytes
at91_mci0: Setting controller bus width to 1
mmc0: <mmc or sd flash card> on mmc0
mmc0: setting transfer rate to 30,000MHz
at91_mci0: Setting controller bus width to 1
Trying to mount root from ufs:/dev/mmc0s1a 6 seconds
warning: no time-of-day clock registered, system time will not be set accurately
Loading configuration files.
Entropy harvesting: interrupts ethernet point_to_point kickstart.
Starting file system checks:
/dev/mmc0s1a: FILE SYSTEM CLEAN; SKIPPING CHECKS
/dev/mmc0s1a: clean, 142394 free (1538 frags, 17607 blocks, 0.7% fragmentation)
)
/dev/mmc0s1e: DEFER FOR BACKGROUND CHECKING
WARNING: /mod was not properly dismounted
Setting hostname: kb920x.
net.inet.ip.portrange.first: 49152 -> 2000
ate0: link state changed to DOWN
ate0: no link ..... giving up
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
  inet 127.0.0.1 netmask 0xff000000
ate0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
  options=8<VLAN_MTU>
  ether 62:73:64:69:6d:70
  media: Ethernet autoselect (none)
  status: no carrier
Additional routing options:.
hw.bus.devctl_disable: 0 -> 1
Mounting NFS file systems:.
ELF ldconfig path: /lib /usr/lib /usr/lib/compat /usr/X11R6/lib /usr/local/lib
Creating and/or trimming log files:.
Starting syslogd.
May 16 22:28:41 syslogd: /var/log/messages R 200K: No such file or directory
May 16 22:28:41 kb920x syslogd: restart
May 16 22:28:41 kb920x syslogd: kernel boot file is /kernel
Initial arm initialization:.
Additional ABI support:.
Starting snmpd.
Starting local daemons:.
Starting sshd.
May 16 22:29:05 kb920x sshd[306]: Server listening on 0.0.0.0 port 22.
Starting cron.
Local package initialization:.
Additional TCP options:.
Starting inetd.
Starting background file system checks in 60 seconds.

Wed May 16 22:29:23 UTC 2007

FreeBSD/arm (kb920x) (ttyu0) 120 seconds

login: May 16 22:30:23 kb920x fsck: /dev/mmc0s1e: NOT USING SOFT UPDATES, CANN
OT RUN IN BACKGROUND
May 16 22:30:23 kb920x fsck:
May 16 22:30:23 kb920x fsck: /dev/mmc0s1e: UNEXPECTED INCONSISTENCY; RUN fsck
MANUALLY.
login: █
```