# IEEE - CNSV

# *emLinux*

## Embedded Linux Systems Developer

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# **Embedded Linux**

- A 17 year old idea for me …
  - 1990 - Network Equipment based on Unix V7
    - stable, small, networking, free, ...
  - 1998 - Network Equipment based on Linux
    - stable, small, networking, free, ...
  - 2000 - A new concept!!! Recognized by Industry
    - stable, small, networking, free, ...
  - 2007 – Mature - Ubiquitous
    - stable, small, networking, free, ...

# Why embedded Linux?

- Marketing -> Legitimacy -> <span style="color:red">Safe Choice</span>
    - no one will get fired for choosing it
- Packaging (SDK,distributions) -> <span style="color:red">Quick Startup</span>
    - tools, configuration helpers, library pruning
- Support -> <span style="color:red">A life preserver</span>
    - most ubiquitous embedded technology
    - better quality support and customers

# What is Embedded Linux?

- Linux OS kernel configured for small embedded applications.
  - A variety of processors and peripherals
- Cross development environment
  - usually from PC/Linux
  - Compile, debug, boot support, nfs
- Optimized libraries and common applications.
  - uClib
  - busybox
- Boot utilities – often includes boot loader
  - uBoot

# Why Embedded Linux

- Free – Like speech.  GPL

- Open source – no more guessing what's inside, waiting for support to respond.

- Many packaged solutions – starting point.

- Vast range of applications & tools

- Resources – books, forums, consultants (emLinux)

# Why Not Embedded Linux

- Management fear of open source
- Indemnification scare, mostly by competitors
- Not always optimal - example
  - eCos is a smaller footprint alternative
    - Less capable, compatible open source OS
    - Typically more costly development

# Current State of Embedded Linux

- Industry Trade Groups
- Commercial Distribution Providers
- Open Source Distributions
- Open Source Projects
- Resources
- Linux in your life

# Industry Trade Groups

- Embedded Linux Consortium (ELC)
  - ELCPS – ELC Platform Spec published
  - ELC swallowed by OSDL
  - OSDL swallowed by Linux Foundation
- Fractured into many focused groups
  - CE Linux Forum – consumer electronics
  - Linux Phone Standards – LIPS forum

# Commercial Distribution Providers

- Shakeout – went from 0 to about 100 down to 20
- Dominant Players:
  - MontaVista – Professional, Carrier, Consumer, Mobile
  - LynuxWorks – Bluecat
  - TimeSys – LinuxLink
- Often develop custom distributions for hardware platforms
  - Example:  TI DaVinci SOC Linux provided by MontaVista

# Open Source Distributions

- **X86 -  bootable CD/Flash distributions**
  - puppyLinux, knoppix, Damn-Small-Linux
  - About 150 more
- **Various CPUs**
  - Embedded Debian
  - Embedded Gentoo
  - ucLinux – smallest, no memory management
  - Many more

# Do You Need to Buy Commercial Embedded Linux?

- Yes
  - You are not familiar with Linux or Unix
  - Getting started quickly is absolutely critical
  - No "plug & play" distribution available

- No
  - You don't mind sorting through C code, library compatibility issues and Makefiles
  - You are doing something really innovative (i.e. weird)

# Resources

- Go to place for who is doing what in embedded Linux space:



- SoC and Board manufacturers
  - Often supply a distro, have documentation, and host support forums
- Still roll you own
  - Kernel.org

# Open Source Projects

**Application Specific Projects**

Zillions of projects for everything imaginable

Sourceforge.org  lists over 7000 projects.

**Asterick – Voip/Telephony**

Open telecom, scales from VIOP phone to large PBX

Rapidly becoming an industry by itself.

Many many many VoIP products based on this.

Runs on other OS besides Linux

# Linux in Your Life

You probably use Linux systems every day

- Google runs on clustered Linux
- 70% of the world's web servers run Apache, most are running Linux
  - LAMP systems popular
      (Linux Apache, MySql, PHP)
- Many voicemail systems, & telecom ops systems
- Corporate disk server farms (NAS, RAID, …)
- Movie animation rendering – i.e.: Titanic, Shrek

# Embedded Linux in Your Life

You might have a Linux system at home

- TiVo is a Linux system
- Wi-Fi APs often based on Linux
- DSL/Cable modem routers often based on Linux
- Some newer, high end cell phones
  - Example: Motorola A910, RIZR Z6

# Wrap Up

- Unabashed plug:

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- Questions?