Tux in Tool-land

Building an Eclipse-based development environment for Embedded Linux
Presented By Jacob Lehrbaum
Outline

- MontaVista Introduction
- Embedded Development Trends
- Eclipse & Open Source
- Embedding Eclipse
- Introduction to MontaVista DevRocket
- Summary
Powering the Embedded Revolution

We provide developers with revolutionary systems software, delivering dramatic reductions in time-to-market and total costs.

We help our customers make money
MontaVista Introduction

Overview

Founded: March 1999

People: 200

Subsidiaries: 8 subsidiaries in Europe and Asia

Customers: Over 1000

Funding: $64 million raised to date

Investors: IBM, Intel, Panasonic, Sony, Toshiba, Yamaha, US Venture Partners, Alloy Ventures, RRE Ventures, WR Hambrecht
MontaVista Introduction

Financial Strength

- Privately Held
- Fully funded
  - Majority of third-round funding still in the bank
- 15 consecutive quarters of revenue growth
- Tripled revenue 2001 to 2003
  - 500 design wins in 2003
  - Product subscriptions >70%
  - Typical software product high gross margins
MontaVista Introduction

MontaVista Linux/Market Map

Communications Infrastructure

Carrier Grade Edition (CGE)
- Wireless and IP – Core/Edge
- Broadcasting
- Wireline Optical

Switches & Routers
- Enterprise Datacom
- Line Cards

Advanced Consumer Electronics

Consumer Electronics Edition (CEE)
- Automotive Telematics
- TV & Home Entertainment
- Mobile & Wireless

Professional Edition (Pro)
- Medical
- Military/Aerospace
- Instrumentation & Control
- General Embedded

Office Equipment
- Home networking

Specialized Solutions

General Purpose Embedded Solutions

General Embedded

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MontaVista Introduction

Broadband Market Map

Carrier Grade Edition

Professional Edition

Consumer Electronics Edition
Selected MontaVista® Linux®
Powered Consumer Electronics

- Sony CoCoon Channel Servers
- Panasonic broadband terminal phone
- Terapin mine Media Jukebox
- MasterIA Beagle PDA GPRS Phone
- Sharp Home Server
- Panasonic Broadnow Broadband Set-top box
- Philips iPronto Remote Control
- Zultys ZIP 4X4 VoIP phone
- NEC AX-10 Home AV Server
- Advanced Communications ECCLE5000 MPEG 4 Set-top Box
- Techsan TS20000 MHP Set-top box
- Kerbango Internet Radio
- Motorola A760 Mobile Phone
- Hippo300 Internet Phone
- Panasonic broadband terminal phone
- Philips iPronto Remote Control
- Zultys ZIP 4X4 VoIP phone
- NEC AX-10 Home AV Server
- Advanced Communications ECCLE5000 MPEG 4 Set-top Box
- Techsan TS20000 MHP Set-top box
- Kerbango Internet Radio
- Motorola A760 Mobile Phone
- Hippo300 Internet Phone
MontaVista Introduction

MontaVista Linux Architecture

Custom & Third Party Applications

Middleware & Application Services

Edition Specific Features

250+ Networking & Application Packages

Board Specific Device Drivers

Reference Hardware

MontaVista Graphics
for MontaVista Linux
Pro and CEE Editions

MontaVista Linux kernel

Real-time Functionality

High Reliability

OSDL Specification

IPMI & Device Mgmt

Power Mgmt

XIP

Target tools

• Analyze System Performance
• Configure XIP

• Runtime App Patcher
• Application Field Debugger

Pro (All Editions)
CEE
CGE
Graphics
3rd Party

Develop & debug platform code
Cross and native development tools
Configure target settings
Create deployable platform images
Trace & Analyze memory and system events
Profile code usage

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Embedded Development Trends

Embedded ≠ Desktop

- Highly customized
- Cross development considerations
- Limited “target” resources

- Wide range of processor architectures
- Wide range of OS choices
- Wide range of tools options
Embedded Development Trends

Embedded Project Trends

- Decreasing time to market
  - 12-24 months moving to <12 months

- Decreasing margins
  - Efficiencies driving down cost
  - Increasing, global competition

- Increasing complexity
  - Always networked, often graphical, multi-purpose, etc
  - Thousands of program lines growing to millions
  - Developer teams growing
Embedded Development Trends

Reducing Development Cost

- Command-line → Graphical Interface
  - EMACS and vi replaced with graphical IDE
  - Significant adoption of Eclipse technology

- Fragmented → Open
  - Software re-use, leverage decreases cost
  - Decreased learning curve

- Proprietary → Linux
  - 50% of embedded projects using Linux
  - 500 MontaVista design wins in ’03
Eclipse and Open Source
“The rapid & broad adoption of Eclipse technology, like that of Linux, leverages the resources of the worldwide Open Source community.

MontaVista proudly demonstrates our commitment to Eclipse, in our adoption of Eclipse as a strategic framework, through our membership in Eclipse.org, and with our contributions to Eclipse technology."

-Jim Ready, CEO of MontaVista Software
Benefits of Open Source

- Vast developer community
  - Encourages open discussion of design & code
  - More architectures & configurations
  - Quick evolution of features

- Yields Significantly higher product quality
  - Increased stress & corner testing
  - Repair of defects quickly

- Raised expectations
Eclipse & Open Source

Why an Open Source IDE?

- The Power of Open Source
  - Community wields significant resources
  - Companies leverage significant value when incorporating open source technology

- Fragmented Environments
  - No clear dominant embedded player
  - Each OS provides different IDE environment
  - ISVs, customers waste tremendous resource handling incompatible environments
Eclipse & Open Source
Why Eclipse?

- Strong adoption and momentum
  - Mature & interesting open source projects receive developer attention, adoption
  - Creates a situation where already successful projects receive the most assistance

- Solid foundation
  - IBM performed a tremendous service with the initial creation & launch of Eclipse, Eclipse.org
  - In its initial Open Source release, Eclipse was already a highly useful and mature tool
Eclipse & Open Source
Embedding Eclipse - Issues

- Missing Key Language Support
  - Majority of embedded developers write code using C, C++ (VDC)
  - Joined CDT project, added CDT Plug-in

- Not Designed for Cross Development
  - CDT designed for native development
  - Added cross-development awareness, ability to connect to remote debug agent
  - Added drop-down menu to switch tool architecture
Eclipse & Open Source
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Eclipse & Open Source
Embedding Eclipse – More Issues

- Application not System Development
  - Designed for apps not system development
  - Added kernel and driver wizards

- Development not Analysis
  - Strong facilities for development, but does not provide analysis, trace, or profiling
  - Difficult to understand what’s going on within an application or a system
  - Added tools that help developers maximize use of constrained resources
Eclipse & Open Source
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Embedding Eclipse - Host Issues

- Targets Boot via Network Hosting
  - System, App software hosted on workstation
  - Requires host have sufficient network facilities
  - Created and/or included DHCP, NFS, and TFTP servers for Windows hosts

- Consistent Across all Hosts
  - Eclipse (Java) portability is key enabler
  - Hosts include Windows, Linux, Solaris
Eclipse & Open Source Host Environment

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MontaVista® DevRocket™ Features

DevRocket enables efficiency

- Automates Typical Tasks, Saves Time
  - Project wizards simplify creation of apps & libraries
  - Generate “ready to deploy” platform images by selecting content & trimming based on need

- Analyze & Optimize Code to Meet Goals
  - Right-size footprint by optimizing library footprint
  - Trace and analyze system events, learn more about system and optimize performance
  - Identify and analyze memory leaks, ensure optimal use of system resources
MontaVista® DevRocket™ Features

DevRocket Project Wizards

Select
Select a wizard

- MontaVista Linux
  - Simple

- Application Project
- Library Project
- Kernel Project
- Platform Image Project

< Back  Next >  Finish  Cancel
MontaVista® DevRocket™ Features

MontaVista DevRocket

- Comprehensive IDE Capabilities
  - Project Creation (kernel, application, filesystem image)
  - Code edit & browsing with syntax awareness & highlighting
  - Revision control client (CVS)

- Cross and Native tools
  - Support for System Software and Application development
  - Target debug session launched automatically from host
  - Graphical operation with optional CLI interface

- Create Platform Images
  - Configure deployable Platform Images with easy to use wizards
  - Optimize library footprint to help meet project goals
  - Prelink applications to enhancement execution performance

- Integrates with Third-party Eclipse-based Plug-ins
MontaVista® DevRocket™ Features

DevRocket C/C++ Development
MontaVista® DevRocket™ Features

Platform Image Wizard

- Create Platform Images
  - Generates fully populated, ready-to-deploy platform images
  - Automatic dependency check ensures inclusion of needed files
  - Produces a variety of file systems (Flash, HDD)
  - Include customized kernel, configured for specifics of your embedded design

- Optimize Library Footprint
  - Automatically optimize runtime library footprint
  - Prunes libraries to achieve project sizing goals

- Prelink Applications
  - Enables quicker start-up and execution time
MontaVista® DevRocket™ Features

DevRocket Platform Creation
MontaVista® DevRocket™ Features

Debug Options in DevRocket

- Application Debug
  - GDB via serial / Ethernet / USB or native

- Kernel Debug
  - Software-based kernel debug (KGDB)
  - Software-based kernel debug (KDB*)

- Hardware-assisted Kernel Debug
  - JTAG/BDM enables System bring-up, download and debugging

*Available in CGE for x86 targets
Debugging with DevRocket

![Debugging with DevRocket]

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MontaVista® DevRocket™ Features

Revision Control Interfaces

- MontaVista DevRocket includes integrated CVS Support
  - Synchronization view: add, commit, update & merge changes in day-to-day development
  - Branching and merging with compare wizard
- Eclipse-based ClearCase plugins Available for integration
  - Open Source & commercial options
MontaVista® DevRocket™ Features
Using CVS with DevRocket
MontaVista® DevRocket™ Features

Trace Tools

- **Linux Trace Toolkit**
  - Sophisticated visualization tool designed for embedded developers
  - Execution tracing of system- and user-level events, including CPU utilization and allocation
  - MontaVista has ported and/or integrated LTT with all officially-supported LSPs (strong value add)

- **Strace**
  - Tracks and displays system calls associated with a running process
Summary

- The success of Eclipse is tied to the power of Open Source
  - Eclipse.org has leveraged contributions of 50+ companies, thousands of developers
- Eclipse is Ideal for Embedded
  - Powerful software development infrastructure
  - Unites a fragmented market
- Eclipse has already experienced significant momentum and adoption
  - We see this trend continuing and growing
  - MontaVista pledges to help fuel this trend